

ラウンドロビン残留応力測定結果 (試験片番号：SM570-3, SUS304-3)

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秋田貢一（武蔵工大）
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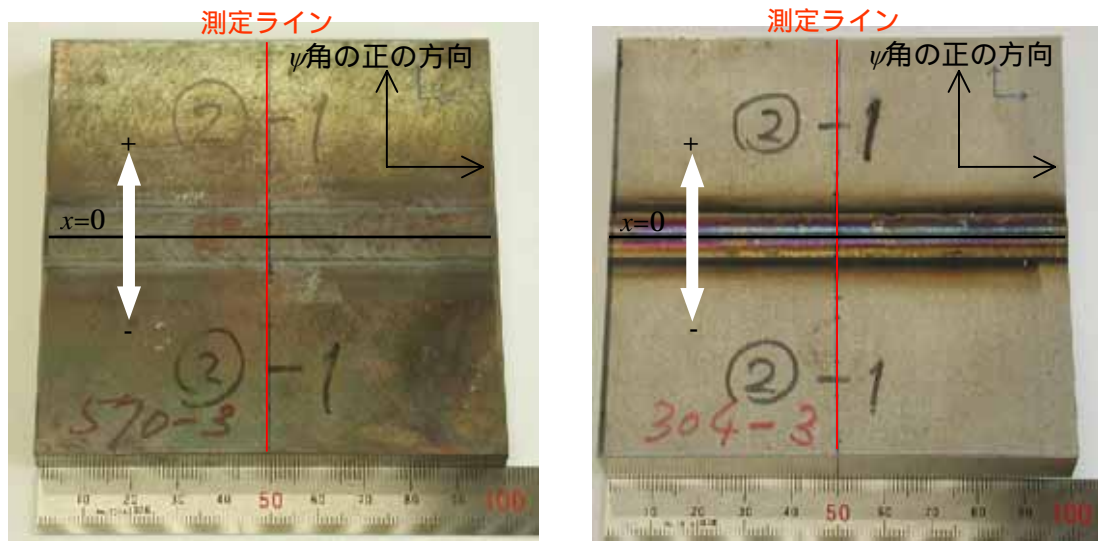
ラウンドロビン残留応力測定

【1】試験片

溶接部残留応力測定小委員会（日本材料学会 X線材料強度部門委員会）

ラウンドロビン試験片 試験片番号：SM570-3, SUS304-3 計2点

測定箇所は，Fig.1における，試験片表面の赤ライン上（Fig.1では，赤線で示したが，実際の試験片上には，マジックでラインが記されている）。



(a)SM570-3

(b)SUS304-3

Fig.1 Specimen for round robin.

【2】実験項目

残留応力分布測定（溶接線直角方向および溶接線方向応力の測定）

- ・ SM570 特性 X 線：Cr-K β で測定 計 1 パターン
- ・ SUS304 特性 X 線：Mn-K α , Cr-K β で測定 計 2 パターン

X 線回折像の観察

- ・ SM570 照射径： $\phi 1$ mm 計 1 パターン
- ・ SUS304 照射径： $\phi 1$ mm , $\phi 2$ mm , $\phi 3$ mm , $\phi 5$ mm 計 4 パターン

【3】実験条件

3.1 測定方法

Fig.1 に示した各試験片において，測定ライン上の応力測定をおこなった．

この測定ライン上において，ビード中心からの距離を x [mm]とし，測定結果に示す各距離 x における，溶接線直角方向応力 σ_T および溶接線方向応力 σ_L を測定した．なお，Fig.1 で，上方向を $+x$ ，下方向を $-x$ としている．

また，試験片表面は提供状態のままとし，測定は ψ 角の正の方向のみ測定した．

3.2 測定条件

各試験片は，以下の条件のもとで測定した．

残留応力分布測定

< SM570-3 >

ラウンドロビン残留応力測定

試験片	ラウンドロビン試験体
	SM570-3
管球	Cr
特性X線	Cr-K
回折面	-Fe211
回折角 [deg]	156.40
フィルタ	V
管電流 [mA]	8
管電圧 [kV]	30
X線スリット	1.2×1.2 mm ² 実照射面積は1.5×1.5 mm ²
sin ² ψ	0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6
Preset count	1024
測定法	並傾法
測定装置	自作並傾法*
検出器	PSPC
X線応力定数 K	-318 MPa/deg**

*【4】装置 A 参照．

**X線応力測定法標準推奨値

< SUS304-3 >

ラウンドロビン残留応力測定

試験片	ラウンドロビン試験体 SUS304-3
管球	Mn
特性X線	Mn-K α
回折面	γ -Fe311
回折角 [deg]	152.2
フィルタ	Cr(使用しない)
管電流 [mA]	5
管電圧 [kV]	30
X線スリット	ϕ 3 mm
$\sin^2 \psi$	0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6
Preset count	2500
測定法	並傾法
測定装置	ビルトアップ型(自作)*
検出器	PSPC
X線応力定数 K	-321 MPa/deg**

ラウンドロビン残留応力測定

測定条件

試験片	ラウンドロビン試験体 SUS304-3
管球	Cr
特性X線	Cr-K β
回折面	γ -Fe311
回折角 [deg]	148.5
フィルタ	-
管電流 [mA]	5
管電圧 [kV]	30
X線スリット	ϕ 3 mm
$\sin^2 \psi$	0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6
Preset count	4000
測定法	並傾法
測定装置	自作並傾法
検出器	PSPC
X線応力定数 K	-366 MPa/deg**

*【4】装置 B 参照 .

**X 線応力測定法標準推奨値

ラウンドロビン残留応力測定 では、測定途中の装置故障により、以下の測定点は、

ラウンドロビン残留応力測定 で使用した “ビルドアップ型 (装置 B)” で測定した .

測定方向	溶接線直角方向	溶接線方向
x [mm]	-7	-3.5
	-3.5	0
	0	3.5

回折像の観察

< SM570-3 >

SM570-3 の観察位置 , 実験条件を次に示す .

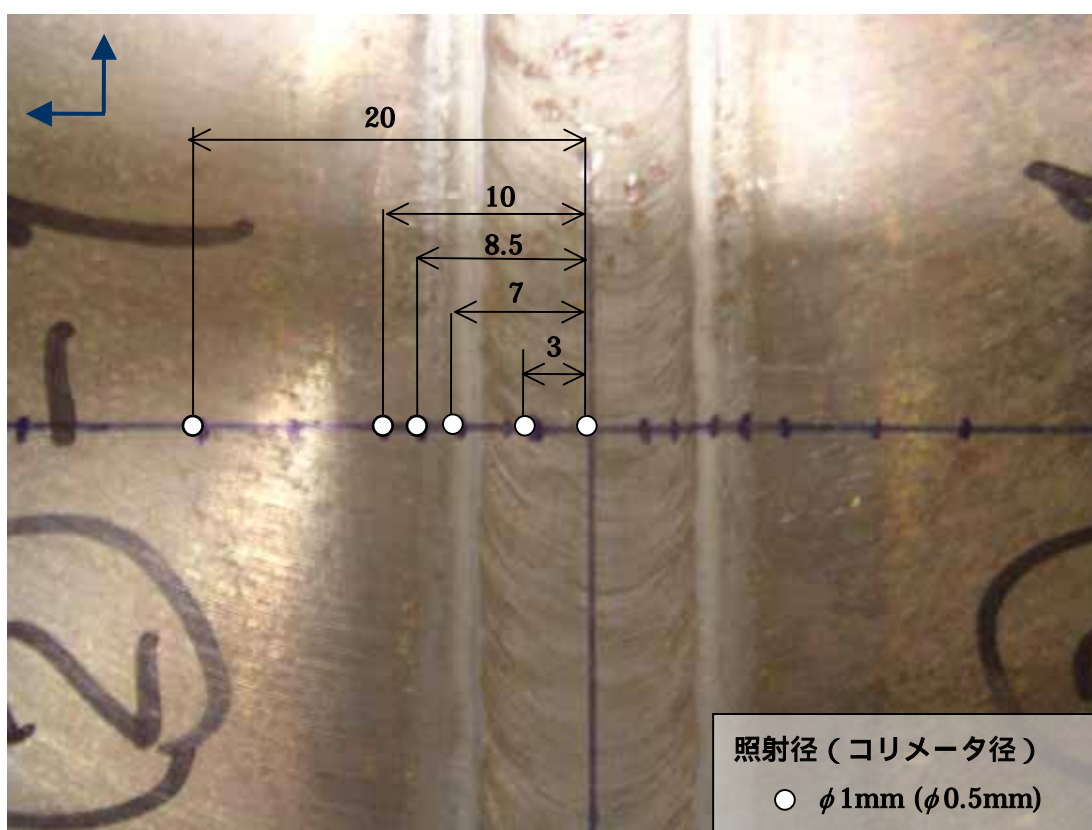


Fig. 2 SM570 の観察位置

特性 X 線	Cr-K
回折面	α -Fe211
回折角	156.4 [deg]
管電圧	30 [kV]
管電流	10 [mA]
検出器	Imaging Plate
試料 - IP 間距離	125 [mm]
読み取り画素サイズ	100 × 100 [μ m]

X 線照射面積

測定に用いた 0.5mm のシングルピンホールを用いた . 照射径は径 ϕ 1mm (リナグラフ上の径) である . (Fig. 2 参照)

観察位置

Fig. 2 の ~ の 6 箇所 (全て $\psi_0 = 0^\circ$) を観察した .

< SUS304-3 >

SUS304-3 の観察位置，実験条件を次に示す．

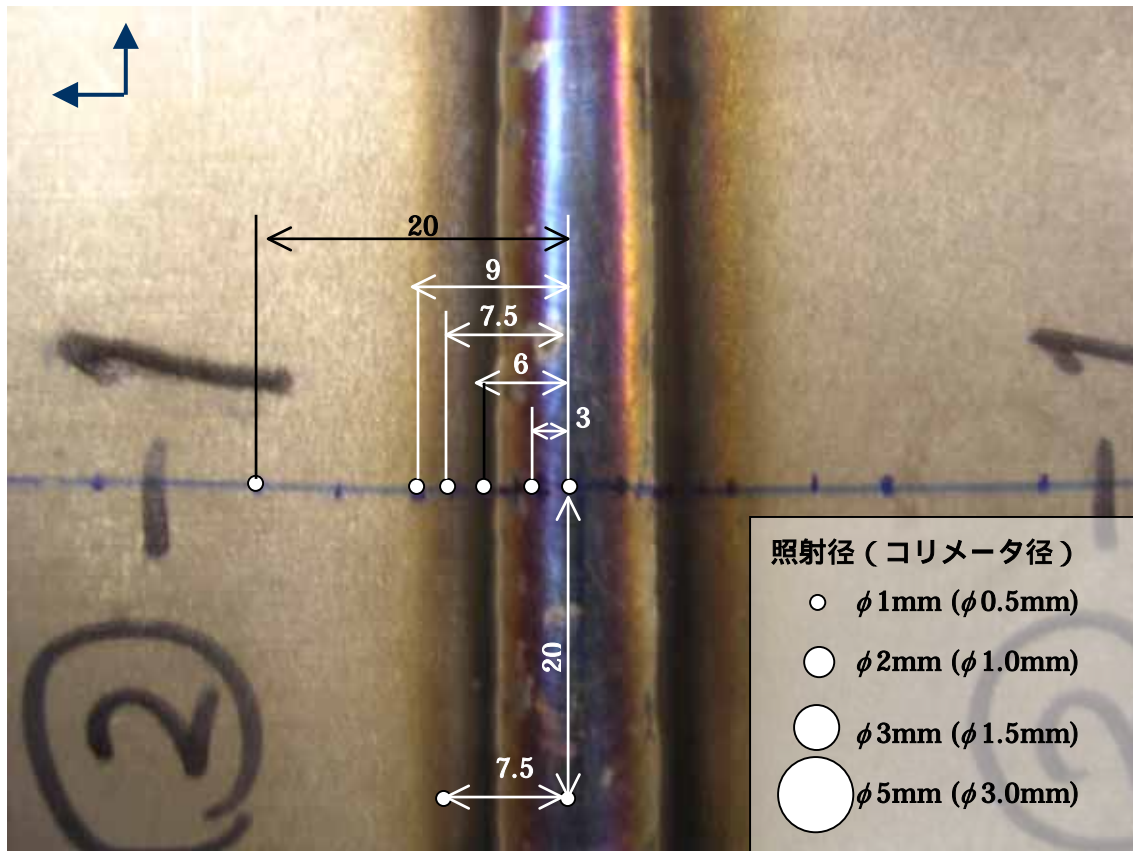


Fig. 3 SUS304-3 の観察位置

実験

特性 X 線	Cr-K
回折面	γ -Fe311
回折角	148.5 [deg]
管電圧	30 [kV]
管電流	10 [mA]
検出器	Imaging Plate
試料 - IP 間距離	81.5 [mm](観察 1) 88 [mm](観察 2)
読み取り画素サイズ	100 × 100 [μ m]

X 線照射面積

測定に用いたコリメータは 4 種類．
径とそのときの照射径（リナグラフ上の径）
は Fig. 3 を参照．

観察位置 1

Fig. 3 の ~ の 6 箇所（全て $\psi_0 = 0^\circ$ ）
ただし，コリメータ径 = $\phi 3.0\text{mm}$
は照射面積が大きいため撮影していない．

観察位置 2

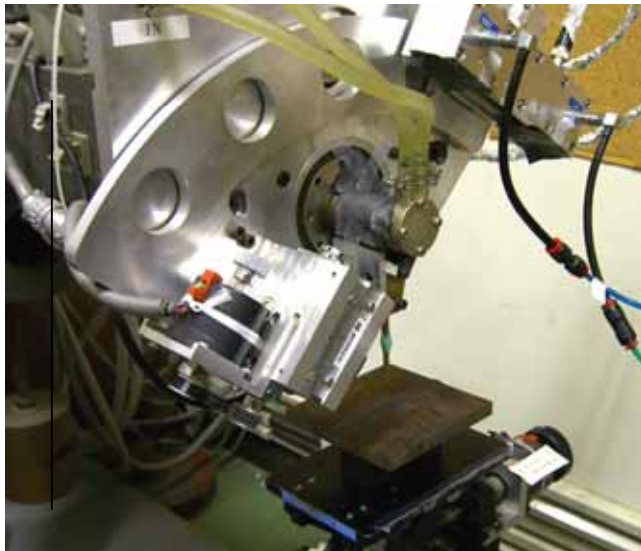
ビード中央部で回折 X 線の違い，熱影響部での
違いを確認するために Fig. 3 の と ， と
を比較した．また，SUS304 のパウダーの
回折像も撮影した．

ただし，測定条件が測定位置 1 と一部異なり
コリメータ径 = 0.5 mm 一定

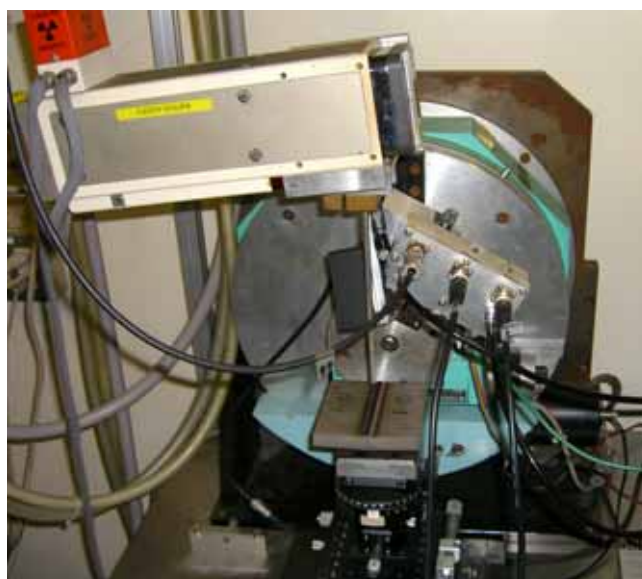
試料 - IP 間距離は 88mm となっている．

【4】測定装置

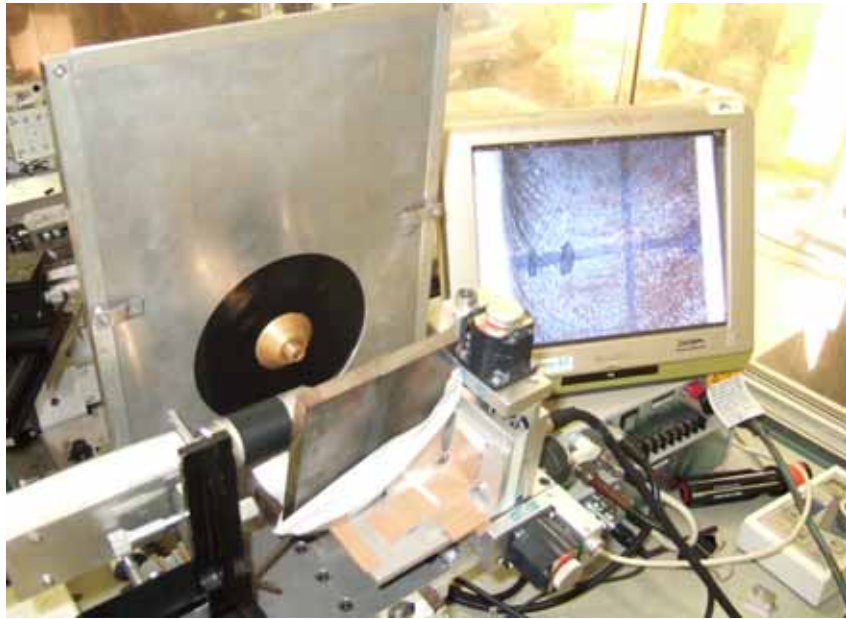
測定に使用した装置の外観を以下に示す。



装置 A：自作並傾法



装置 B：ビルトアップ型（自作）



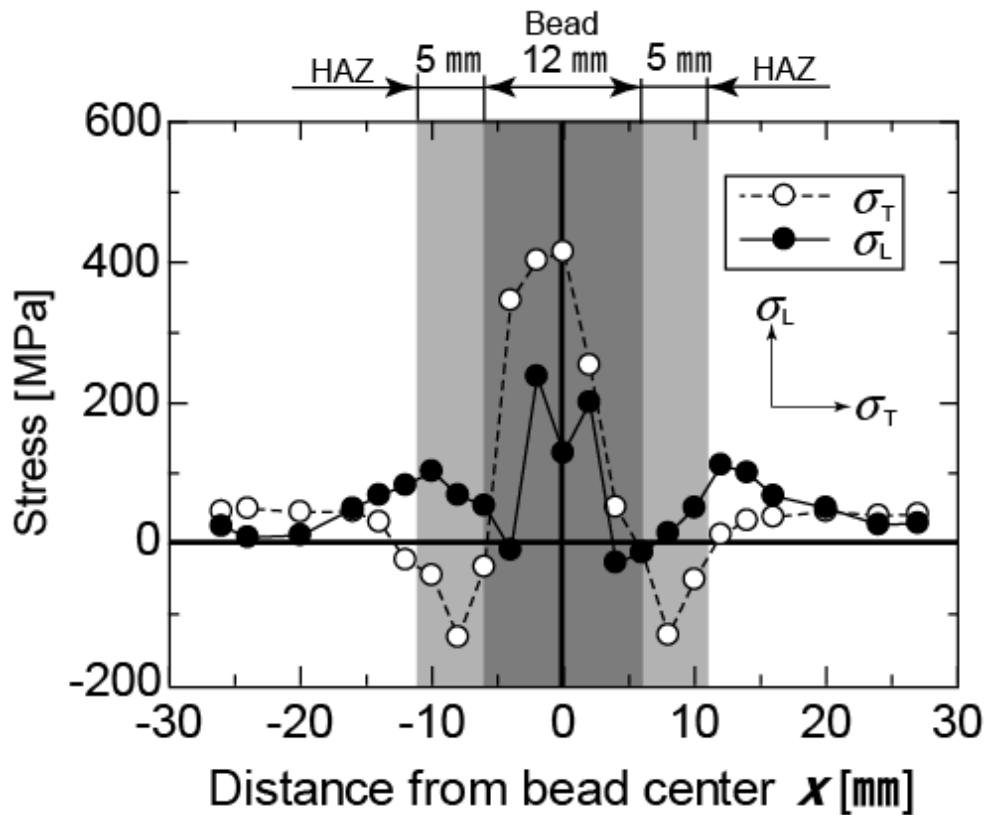
装置 C : X 線カメラ



装置 D : IP リーダー (BAS-1000)

SM570-3 測定結果

ラウンドロビン残留応力測定結果 (SM570-3)



溶接線直角方向

x [mm]	σ_T [MPa]	σ_T [MPa]
-26	46	25
-24	50	19
-20	45	27
-16	46	33
-14	31	42
-12	-23	29
-10	-45	52
-8	-133	53
-6	-33	152
-4	346	112
-2	403	144
0	415	130
2	254	81
4	52	89
6	-12	135
8	-130	58
10	-51	56
12	13	43
14	33	44
16	38	33
20	46	38
24	40	27
27	42	23

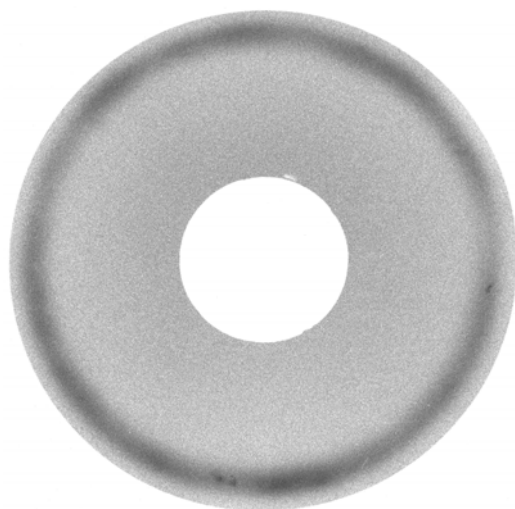
溶接線方向

x [mm]	σ_L [MPa]	σ_L [MPa]
-26	25	18
-24	9	20
-20	12	23
-16	50	17
-14	69	20
-12	83	24
-10	103	34
-8	69	62
-6	54	50
-4	-9	52
-2	238	84
0	129	93
2	201	99
4	-27	128
6	-13	130
8	15	75
10	51	31
12	112	31
14	101	16
16	68	18
20	51	24
24	27	17
27	29	15

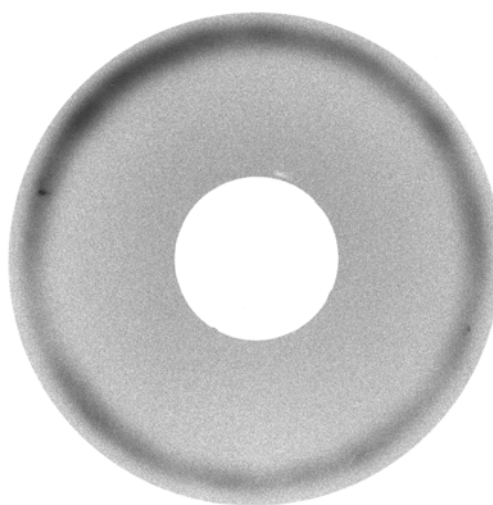
SM570-3 回折像

SM570 の観察結果

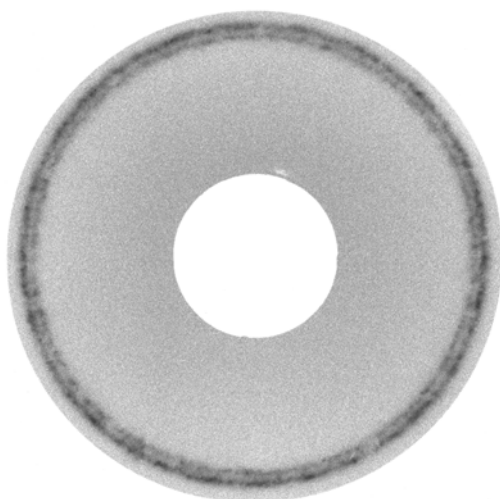
SM570 の回折像を以下 Fig. 1(1)~(6)に示す.



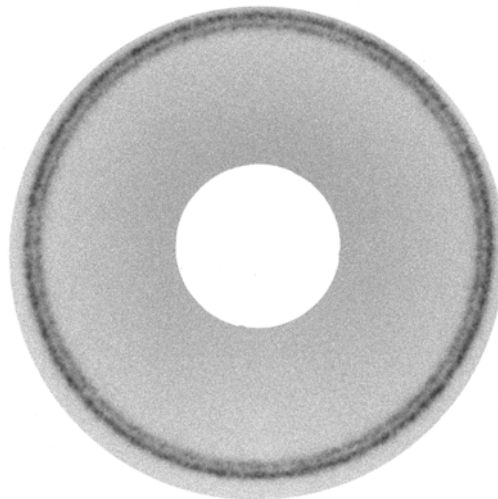
(1) 観察位置 (ビード部中央)



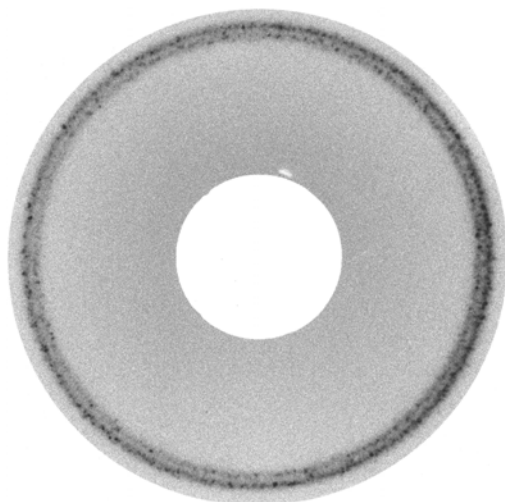
(2) 観察位置 (ビード部)



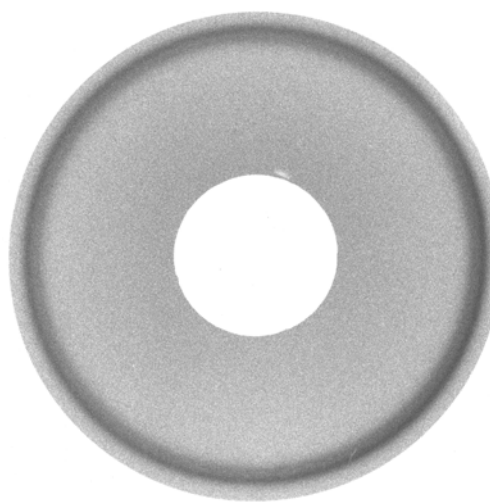
(3) 観察位置 (熱影響部)



(4) 観察位置 (熱影響部)



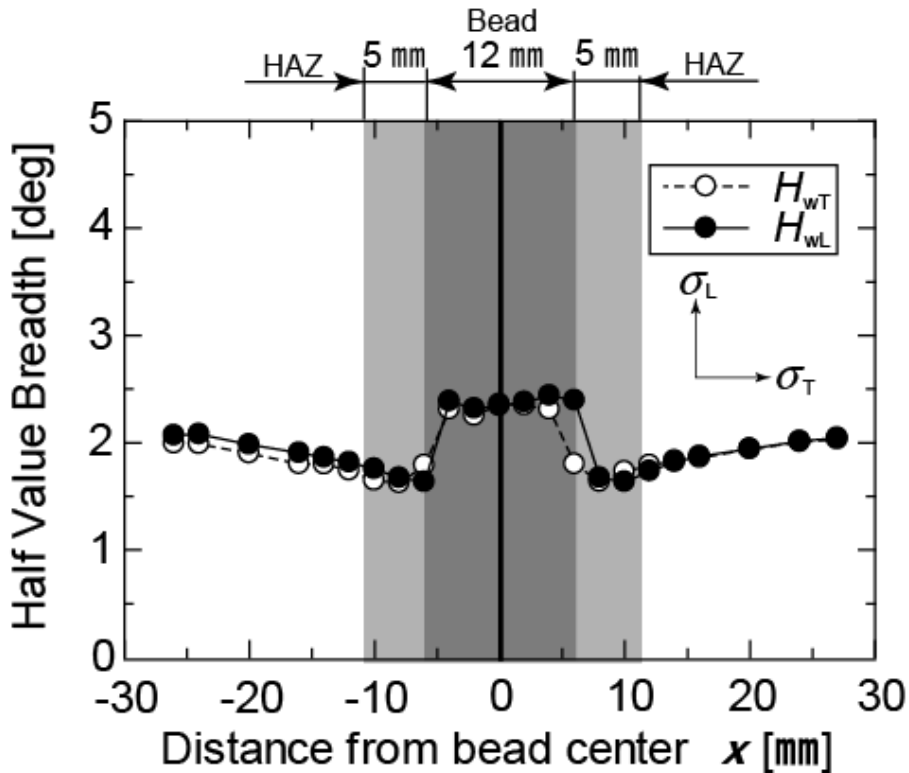
(5) 観察位置 (熱影響部)



(6) 観察位置 (母材部)

Fig. 1 SM570 の回折像

ラウンドロビン半価幅分布 (SM570-3)



各点は, 半価幅平均値

溶接線直角方向

x [mm]	HVB [deg]
-26	1.992
-24	1.986
-20	1.900
-16	1.800
-14	1.797
-12	1.740
-10	1.647
-8	1.623
-6	1.788
-4	2.308
-2	2.251
0	2.359
2	2.348
4	2.308
6	1.799
8	1.635
10	1.730
12	1.790
14	1.832
16	1.858
20	1.940
24	2.006
27	2.030

溶接線方向

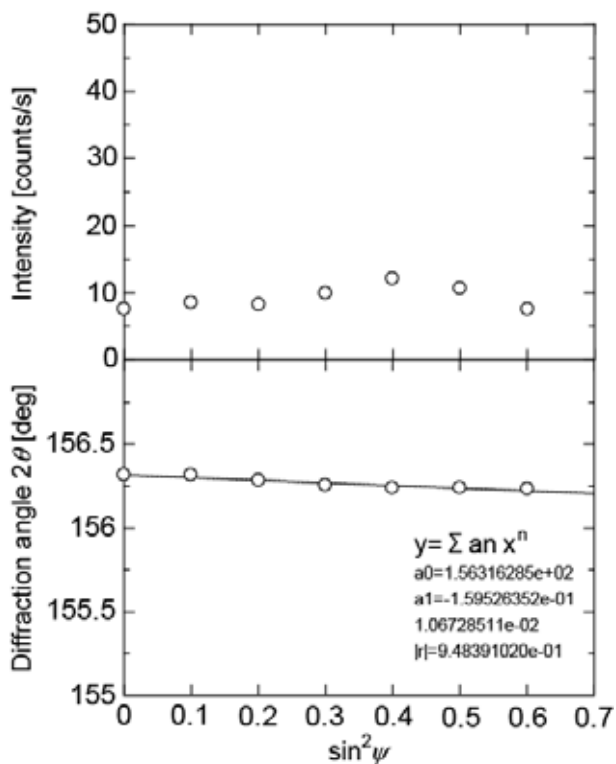
x [mm]	HVB [deg]
-26	2.067
-24	2.078
-20	1.982
-16	1.904
-14	1.861
-12	1.816
-10	1.755
-8	1.671
-6	1.633
-4	2.386
-2	2.317
0	2.343
2	2.378
4	2.438
6	2.394
8	1.673
10	1.634
12	1.734
14	1.820
16	1.873
20	1.942
24	2.014
27	2.044

SM570-3 生データ

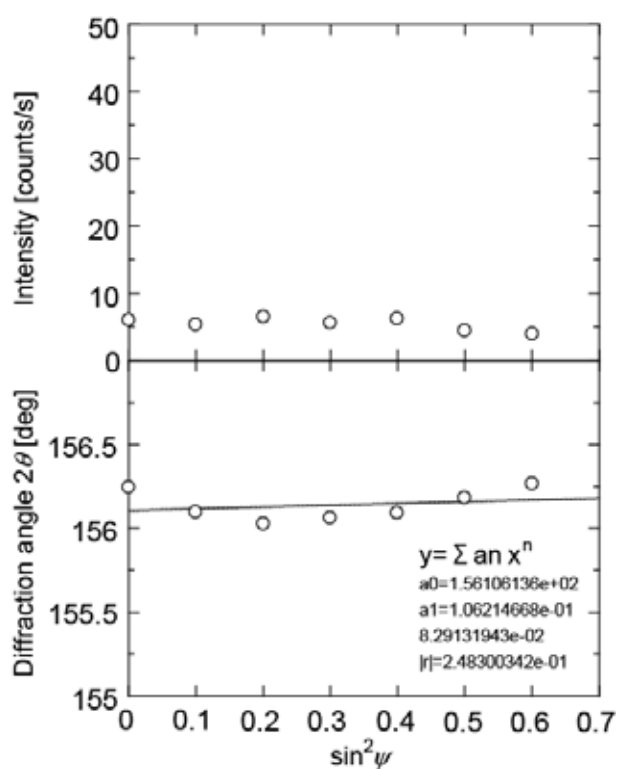
SM570-3 溶接線直角方向

Intensity

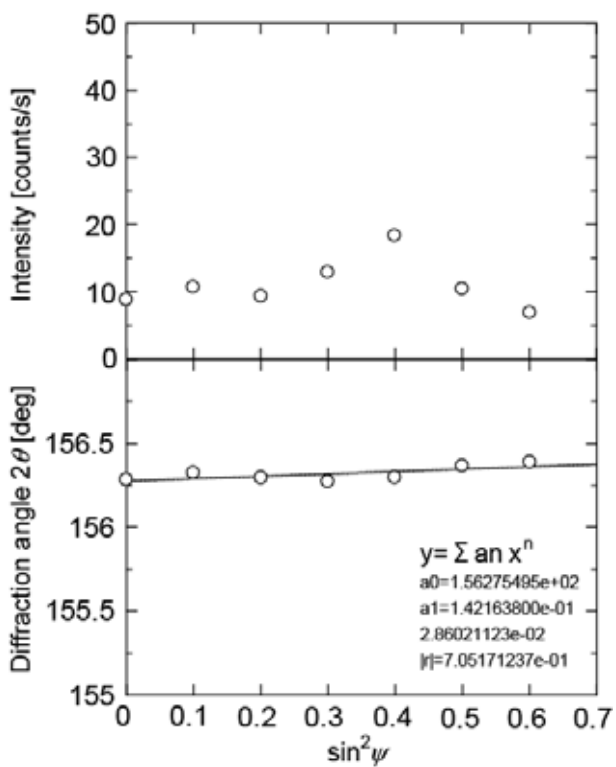
母材部 (x=-24[mm])



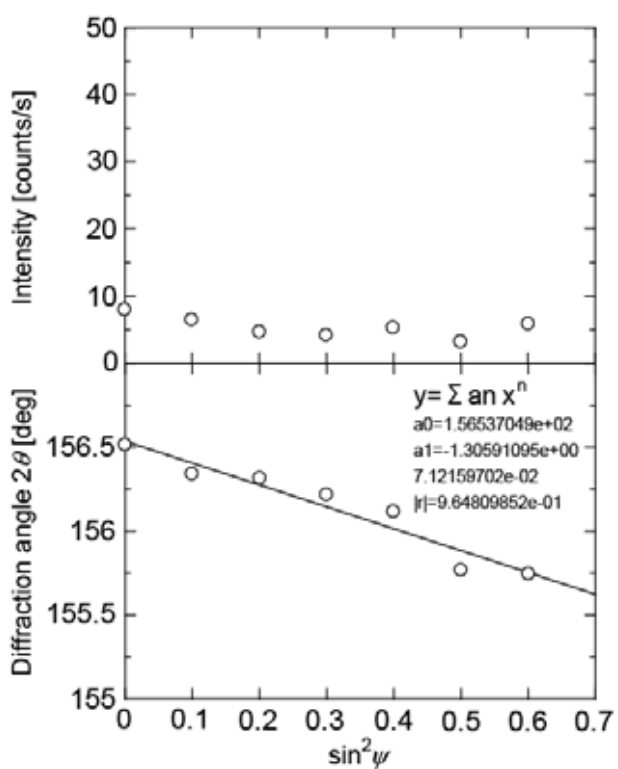
上端部 (x=-6[mm])



熱影響部 (x=-10[mm])

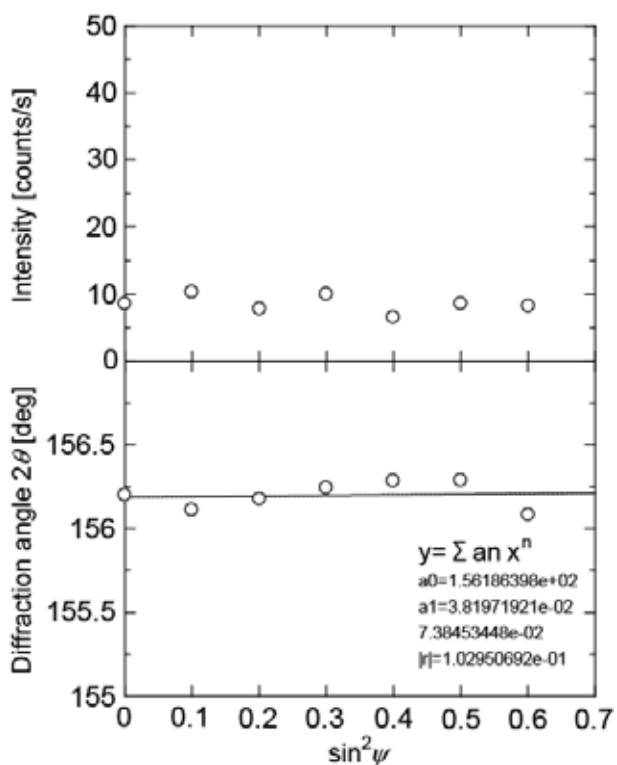


ヒード部 (x=0[mm])

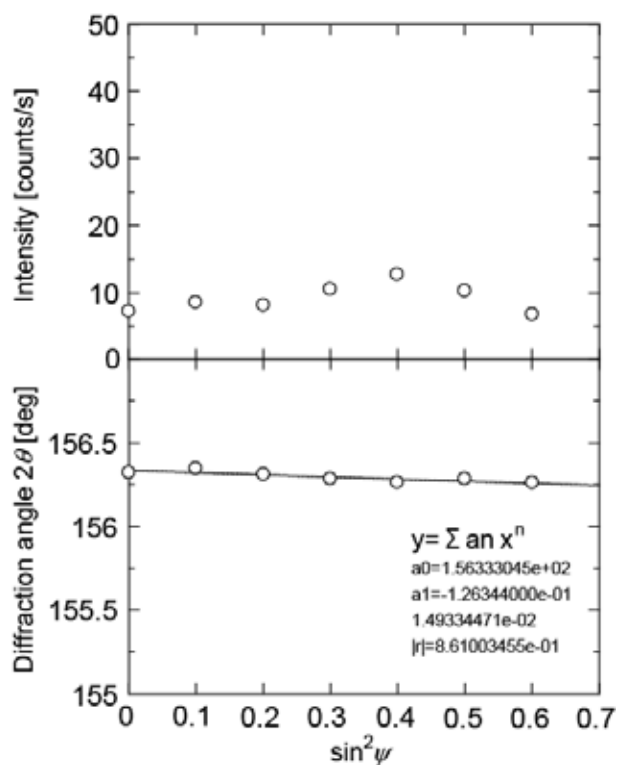


SM570-3 溶接線直角方向

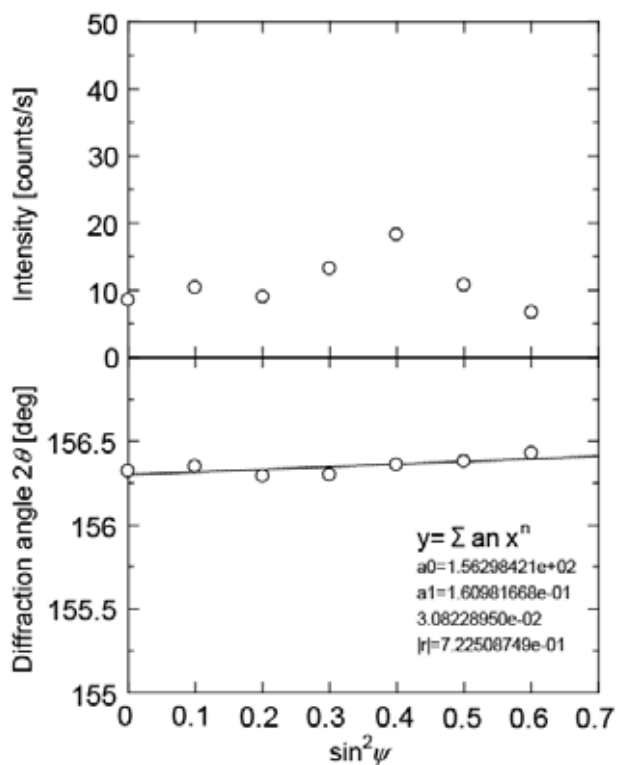
止端部 (x=6[mm])



母材部 (x=24[mm])



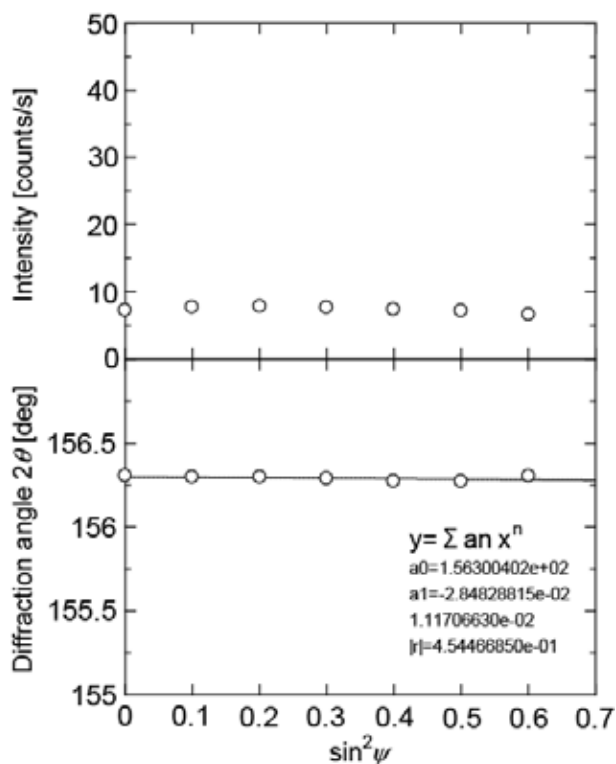
熱影響部 (x=10[mm])



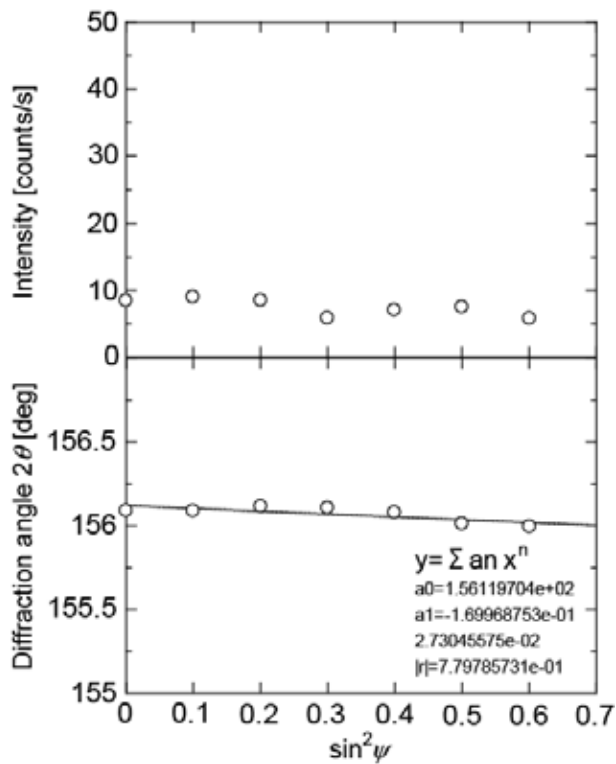
SM570-3 溶接線方向

Intensity

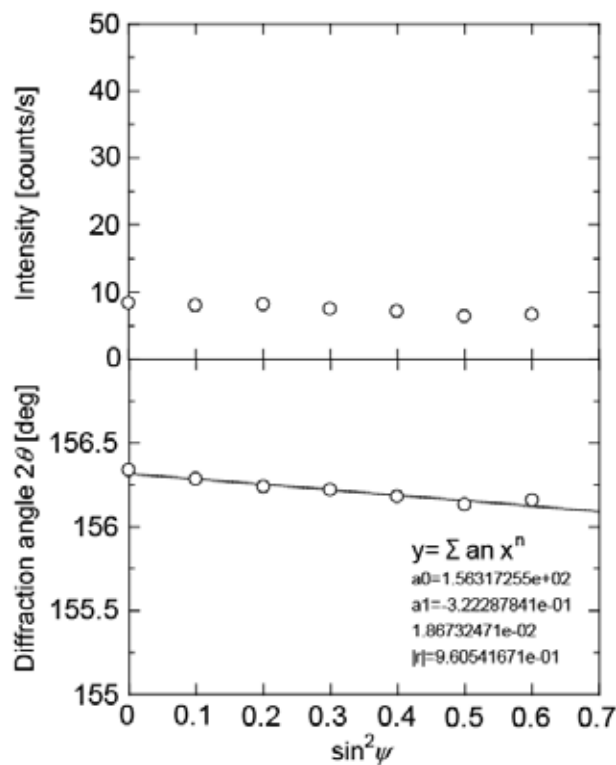
母材部 (x=-24[mm])



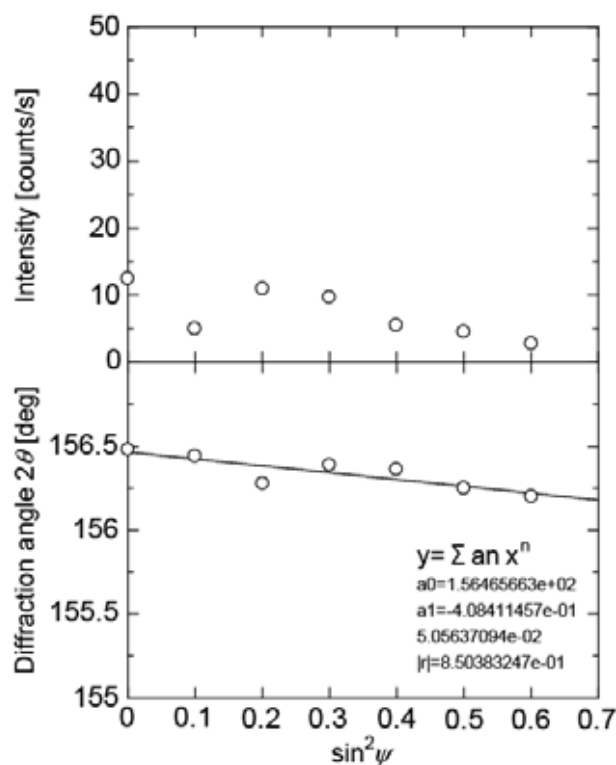
上端部 (x=-6[mm])



熱影響部 (x=-10[mm])

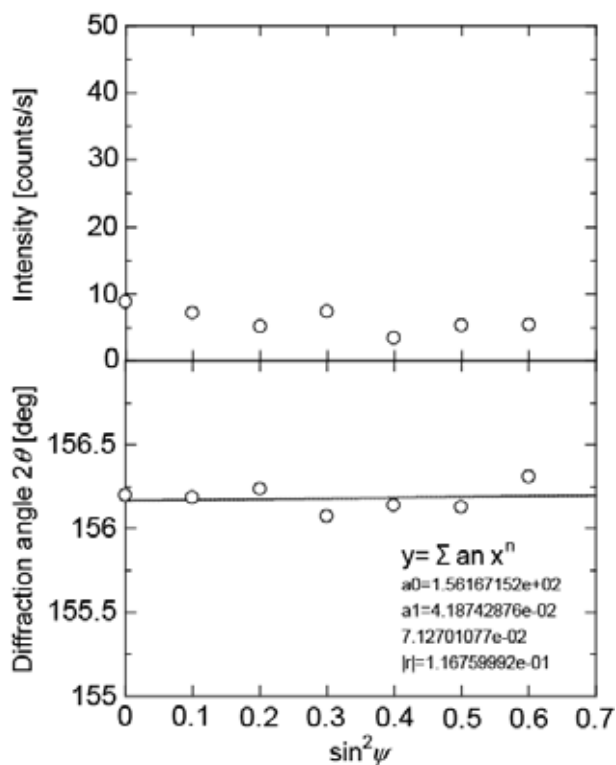


ヒード部 (x=0[mm])

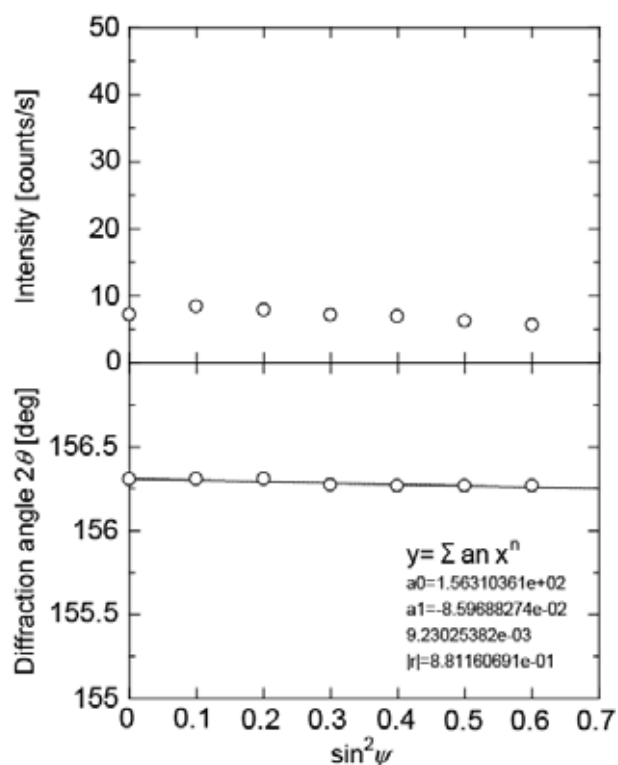


SM570-3 溶接線方向

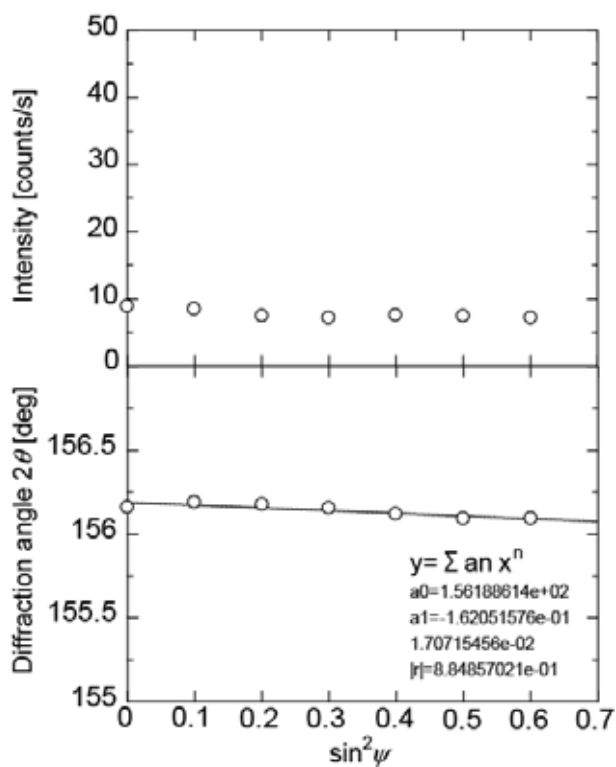
止端部 (x=6[mm])



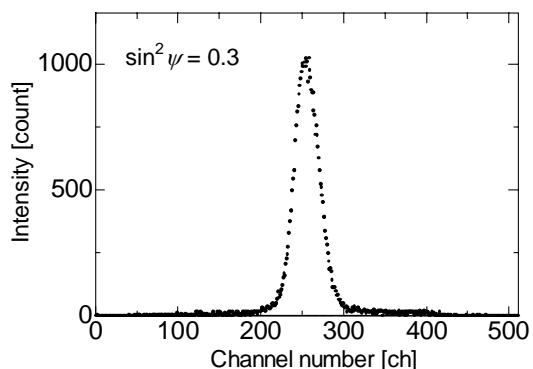
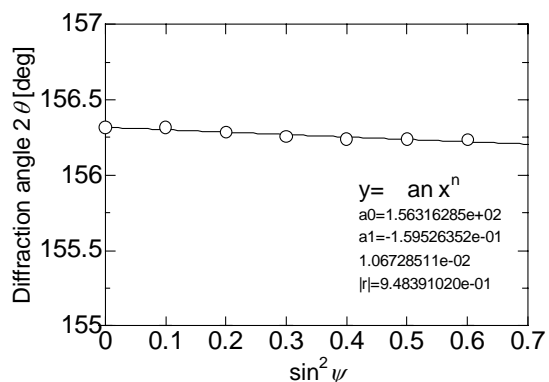
母材部 (x=24[mm])



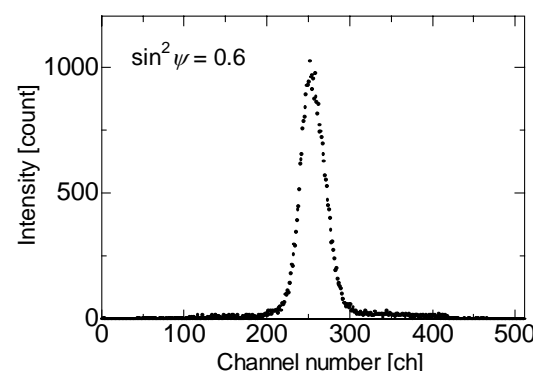
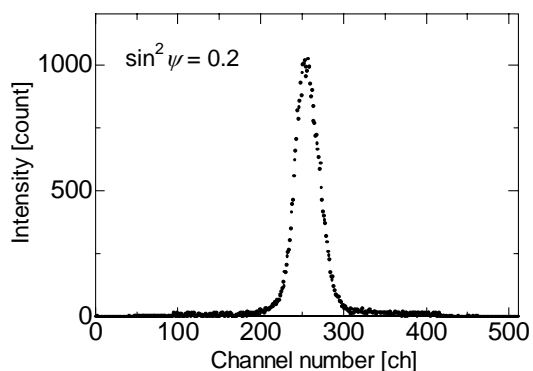
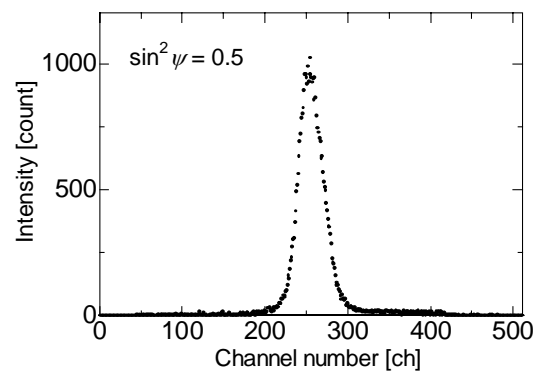
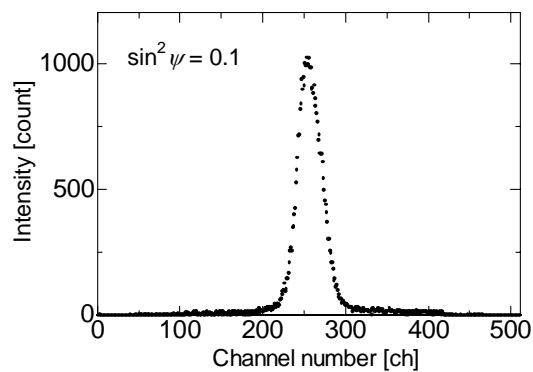
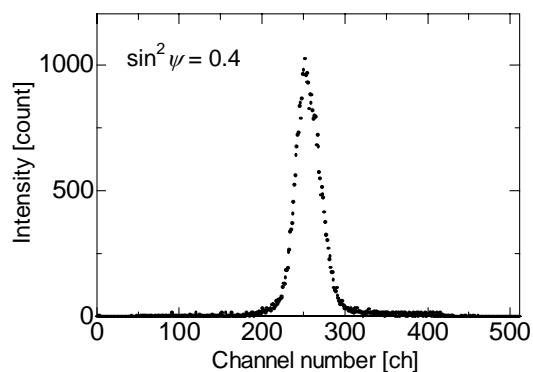
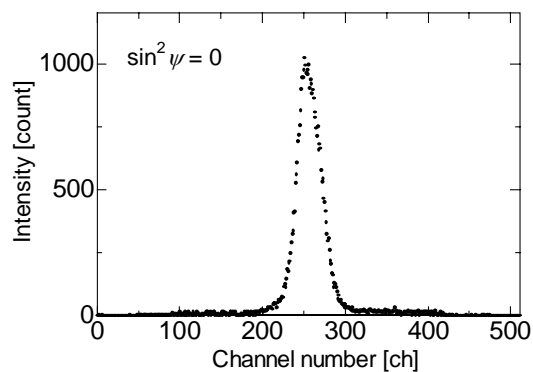
熱影響部 (x=10[mm])



$\sin^2 \psi$ 線図



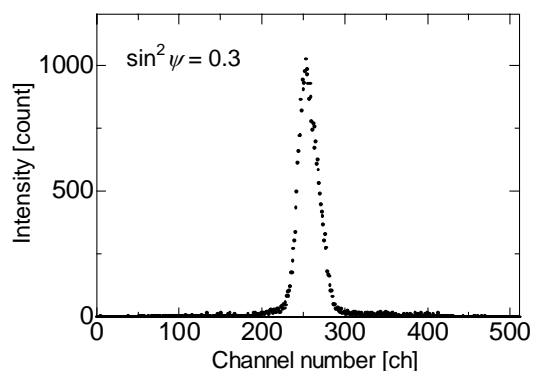
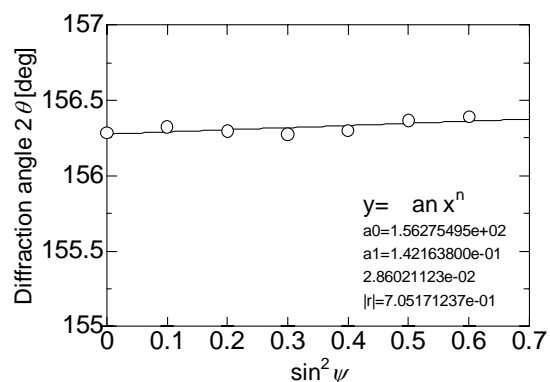
Profile



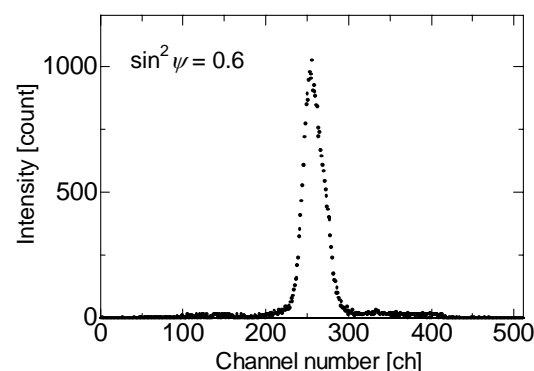
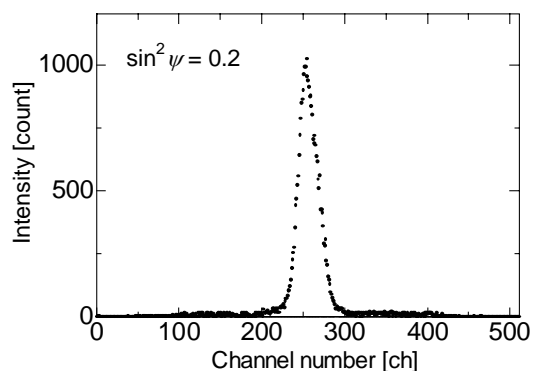
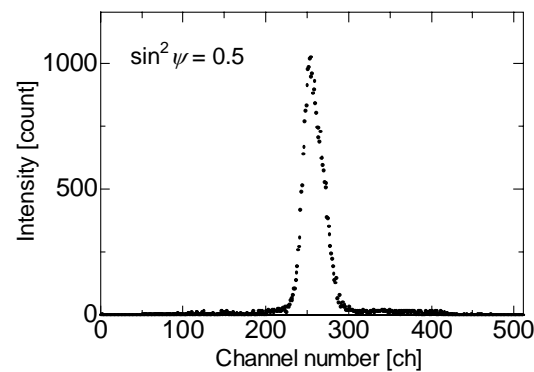
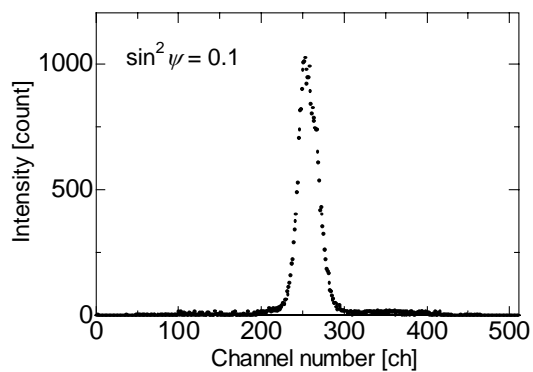
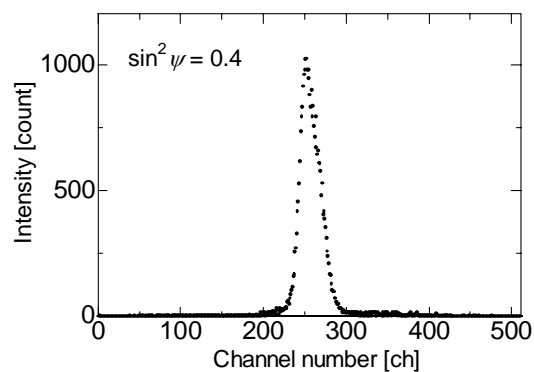
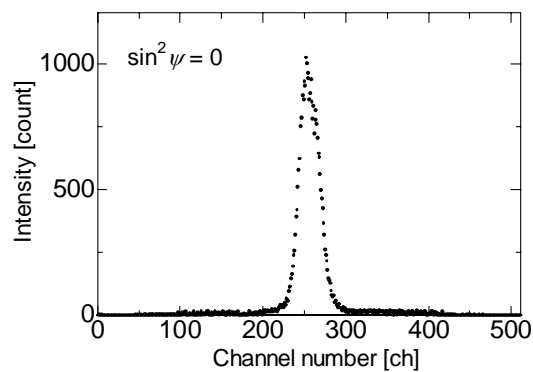
SM570-3 溶接線直角方向

熱影響部 (x=-10 mm)

sin²ψ 線圖



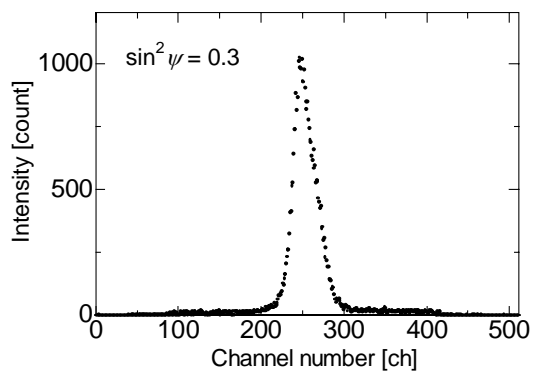
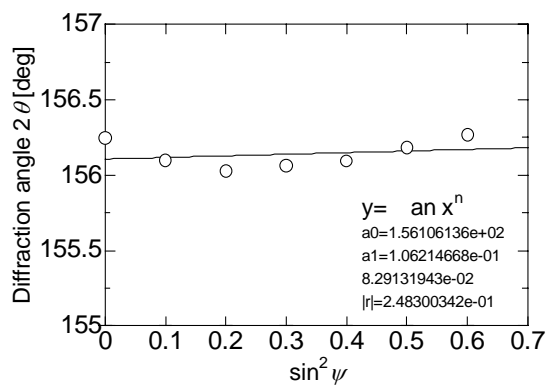
Profile



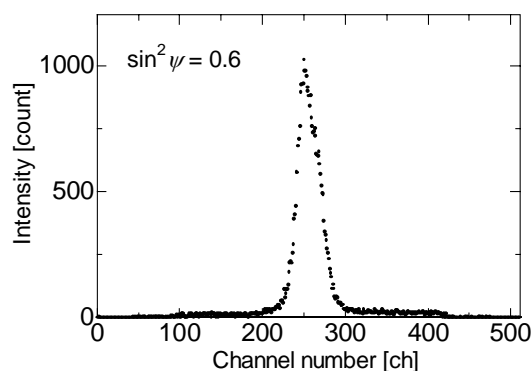
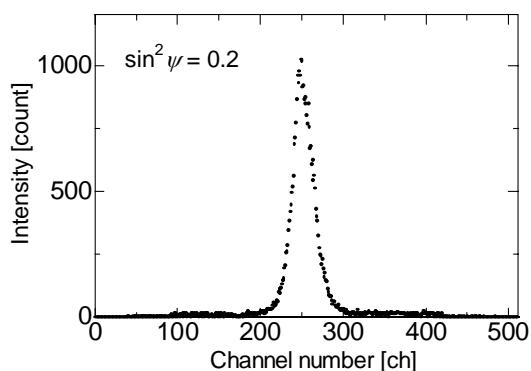
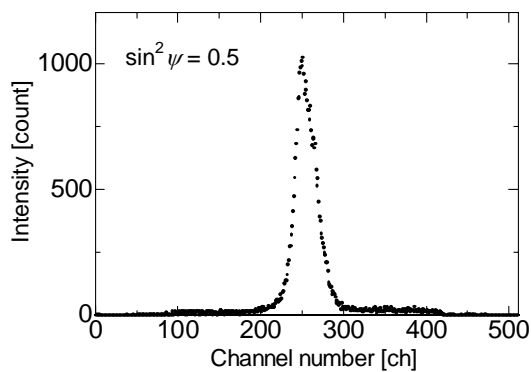
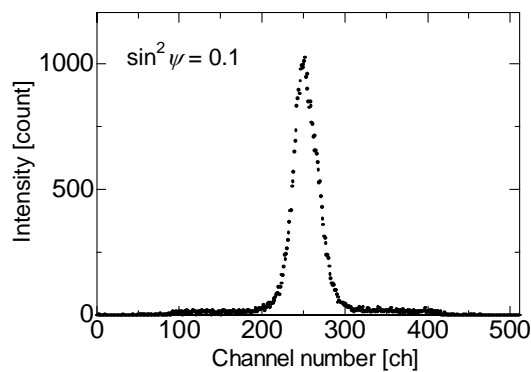
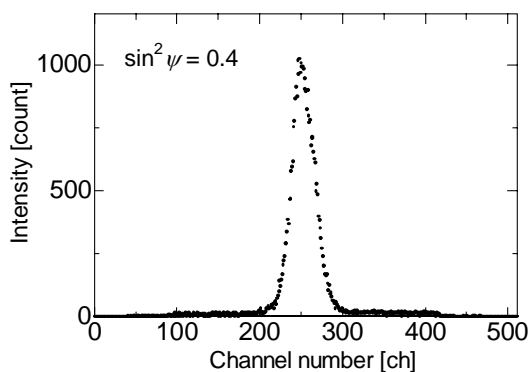
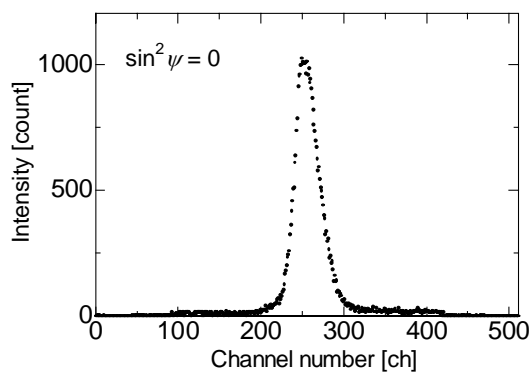
SM570-3 溶接線直角方向

止端部 (x=-6 mm)

$\sin^2 \psi$ 線図



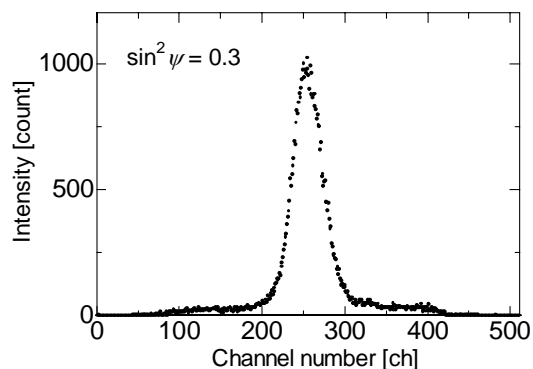
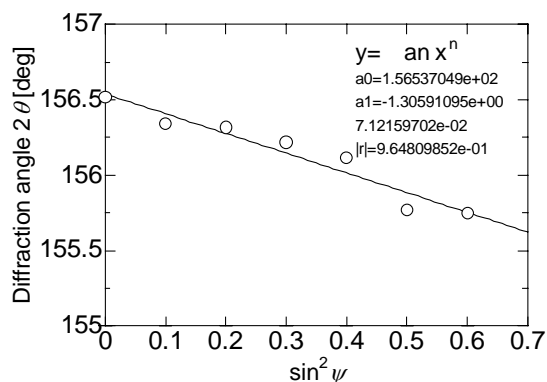
Profile



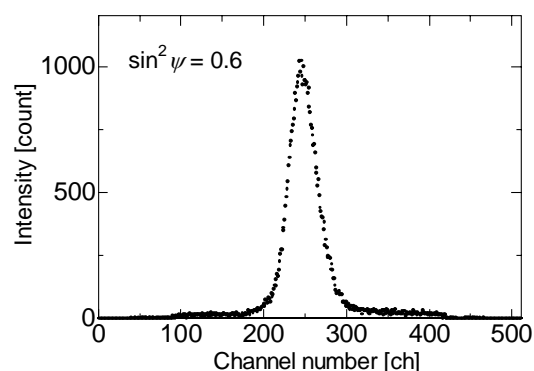
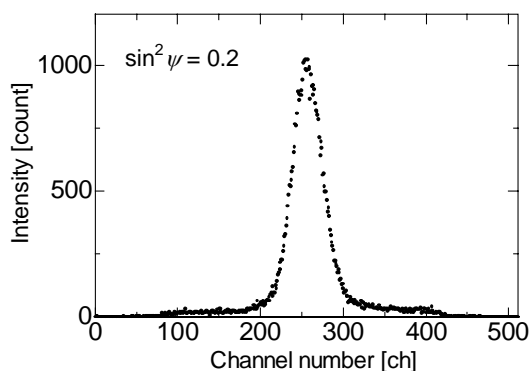
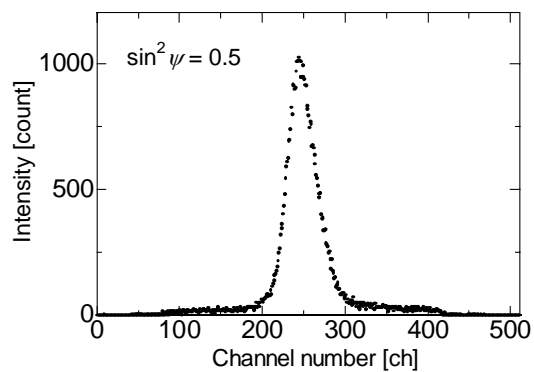
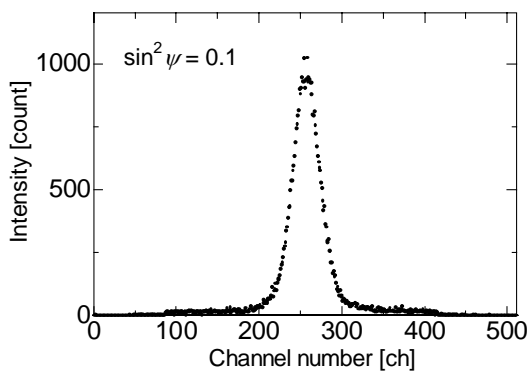
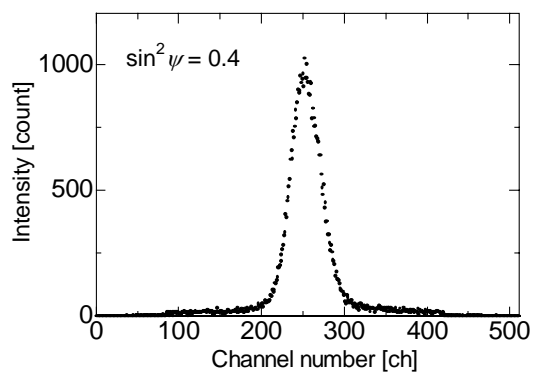
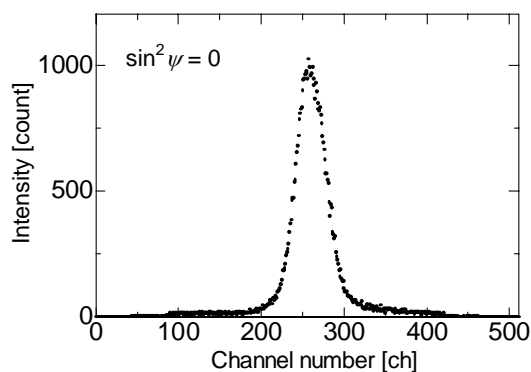
SM570-3 溶接線直角方向

ビード部 (x=0 mm)

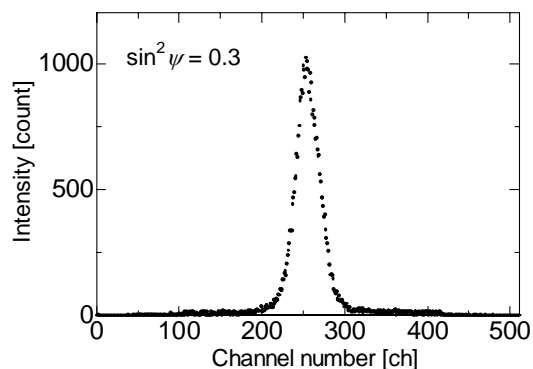
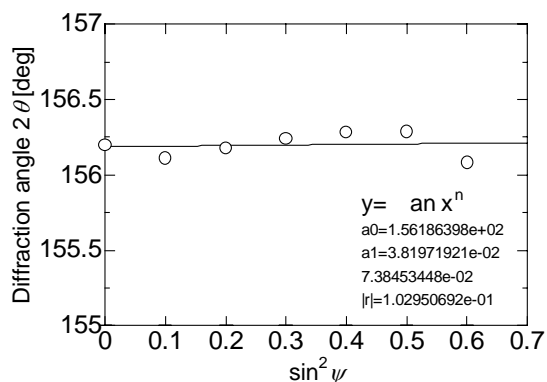
$\sin^2 \psi$ 線図



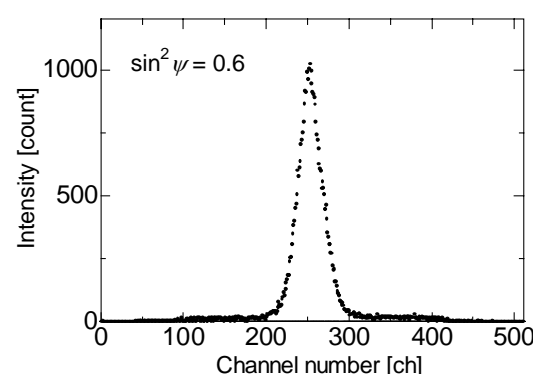
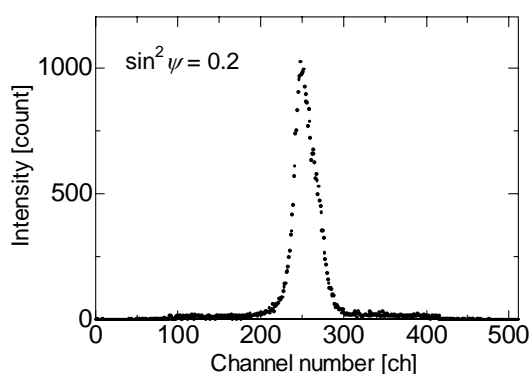
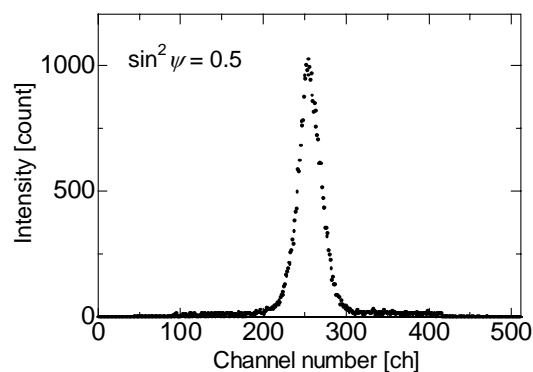
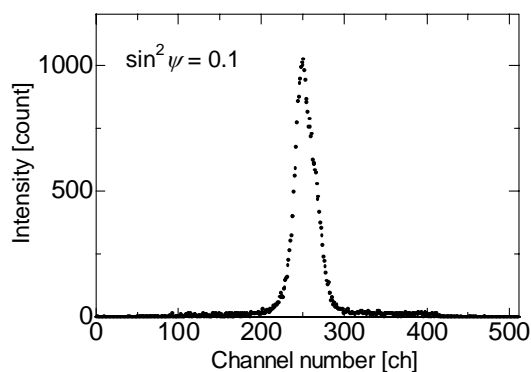
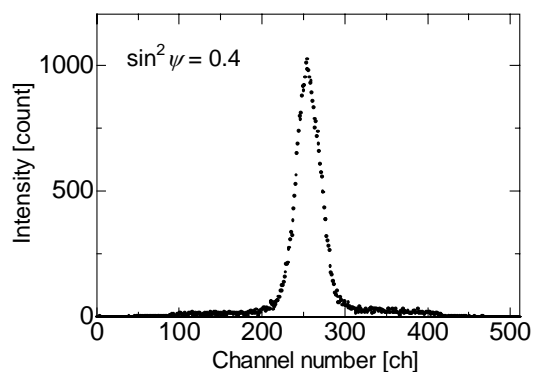
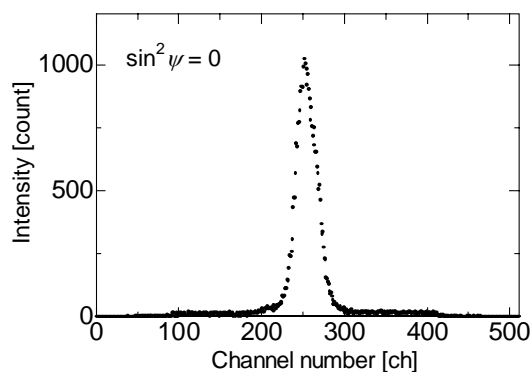
Profile



$\sin^2 \psi$ 線図



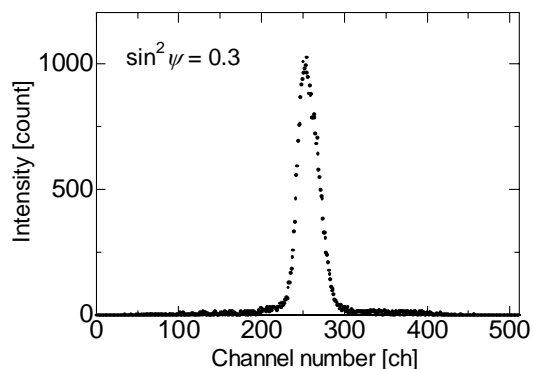
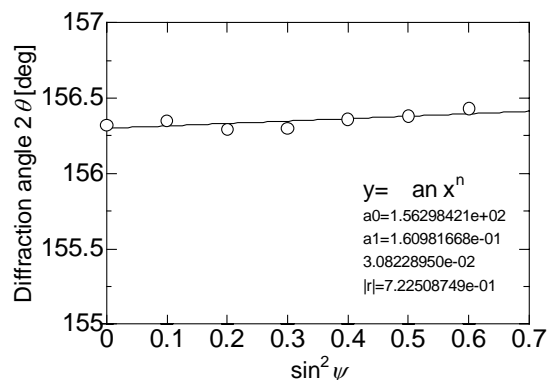
Profile



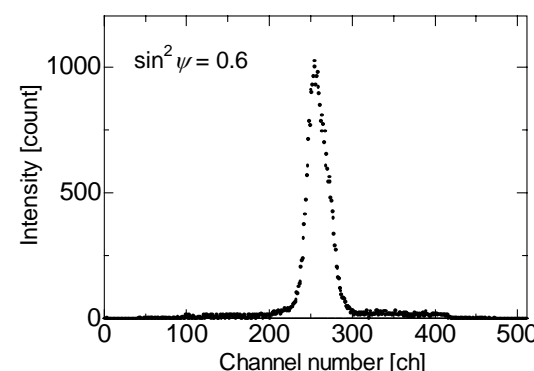
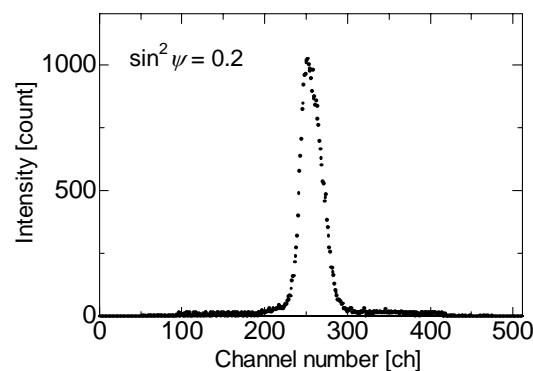
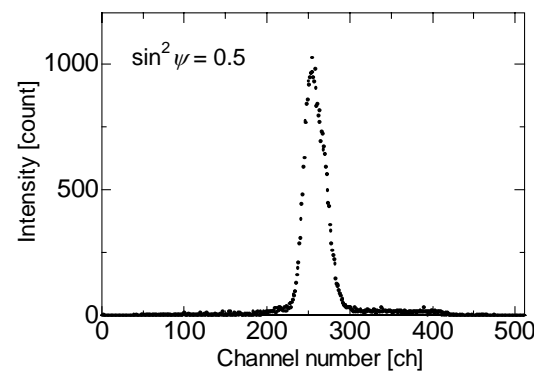
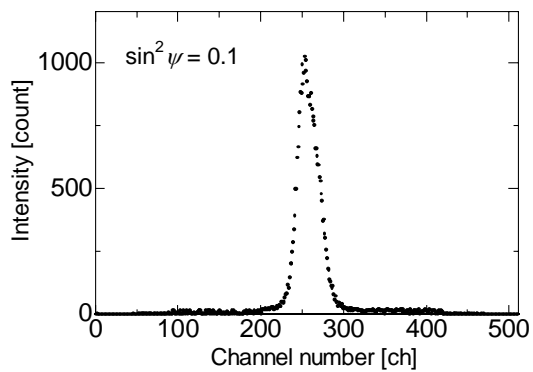
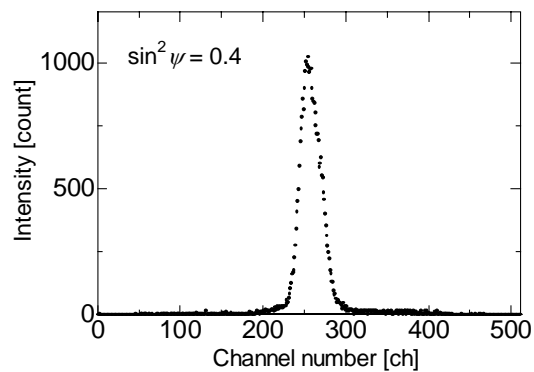
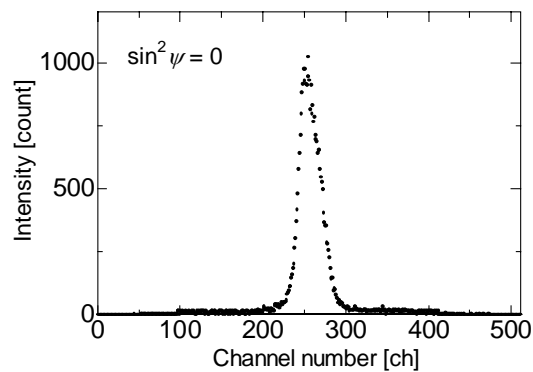
SM570-3 溶接線直角方向

熱影響部 (x=10 mm)

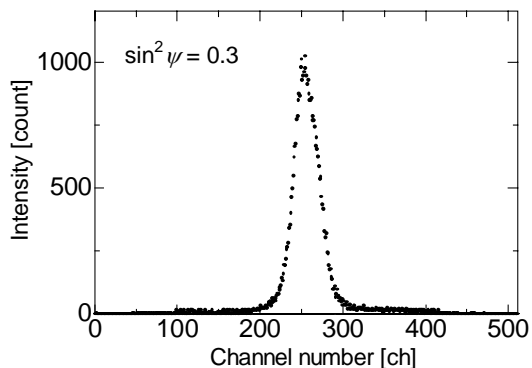
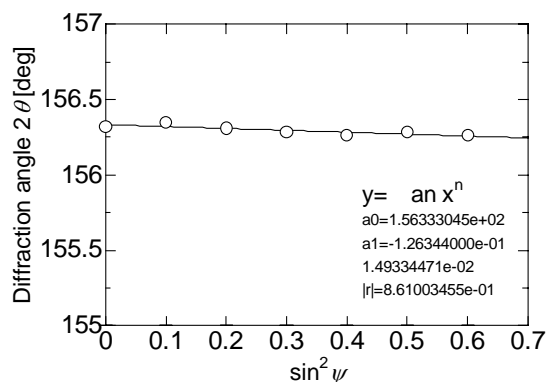
$\sin^2 \psi$ 線圖



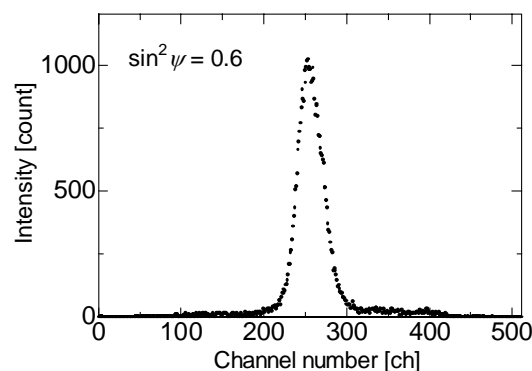
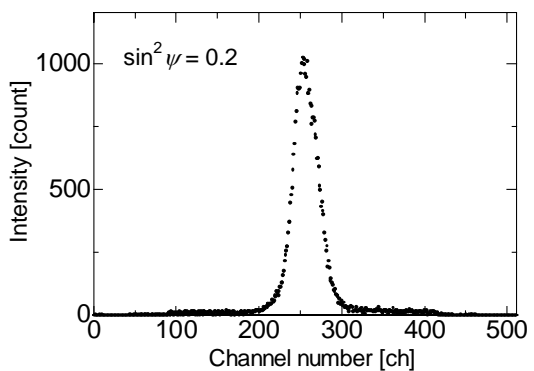
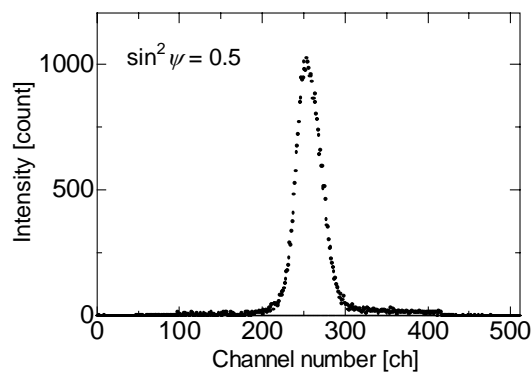
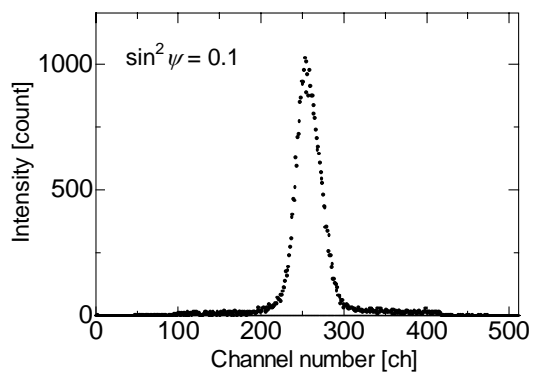
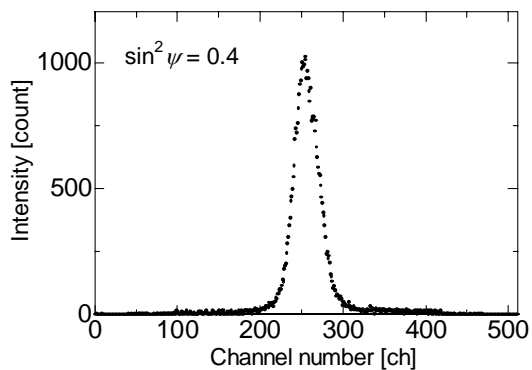
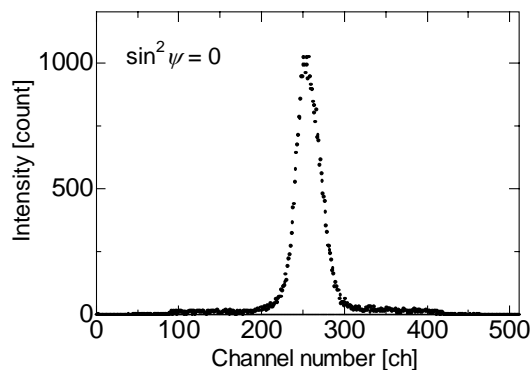
Profile



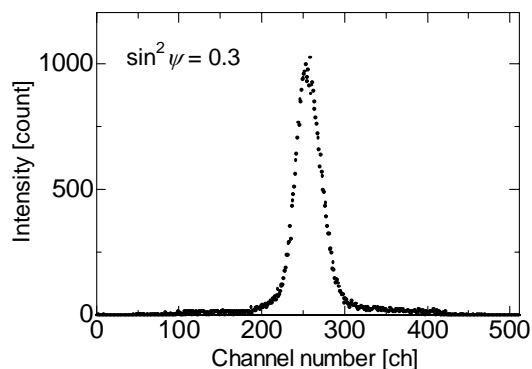
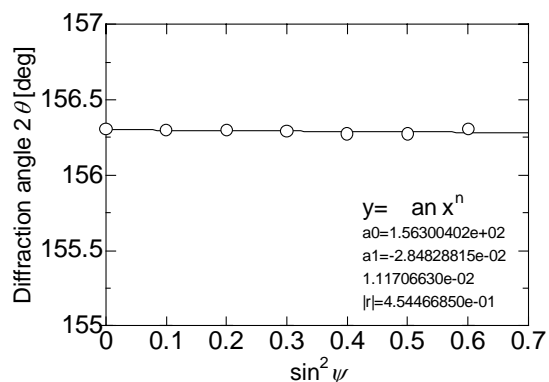
$\sin^2 \psi$ 線図



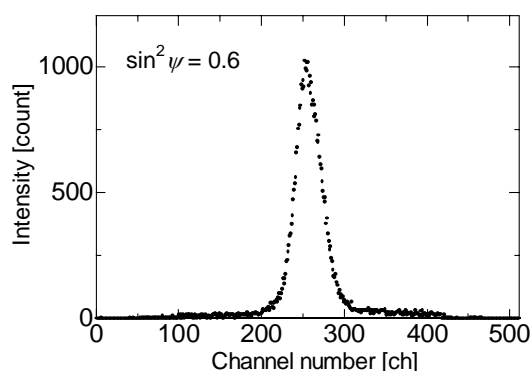
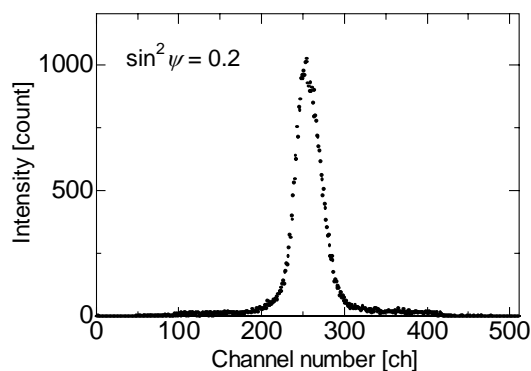
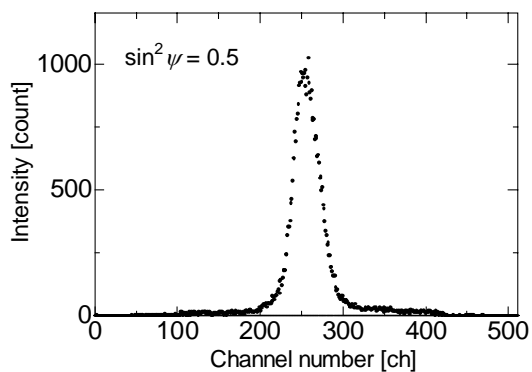
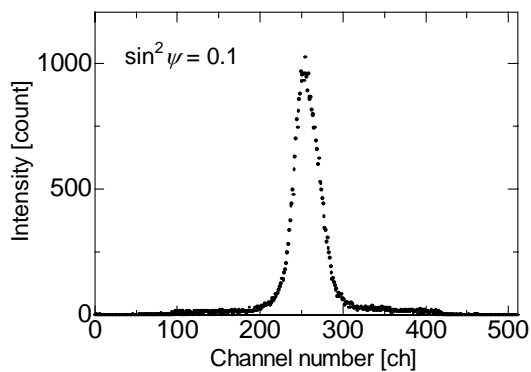
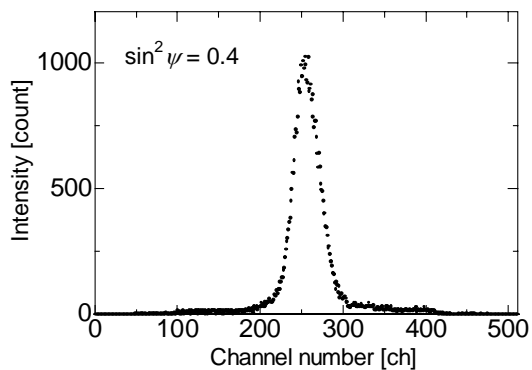
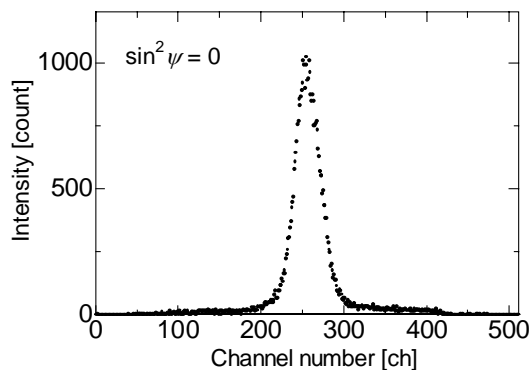
Profile



$\sin^2 \psi$ 線図



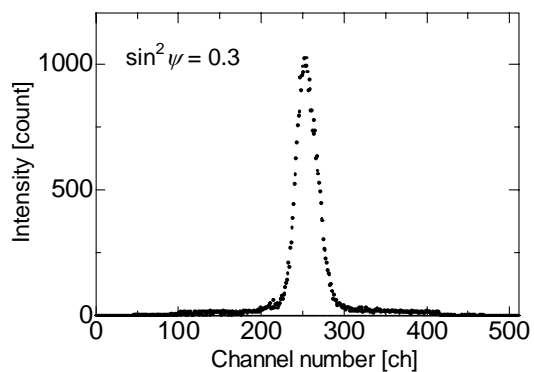
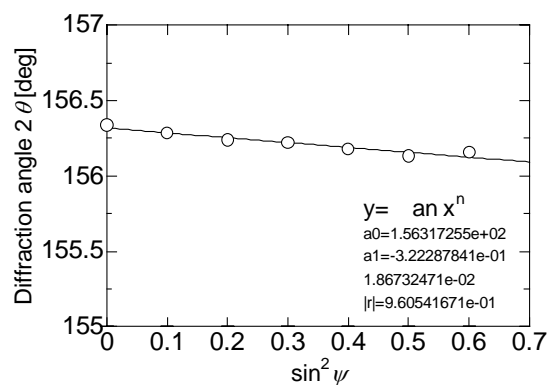
Profile



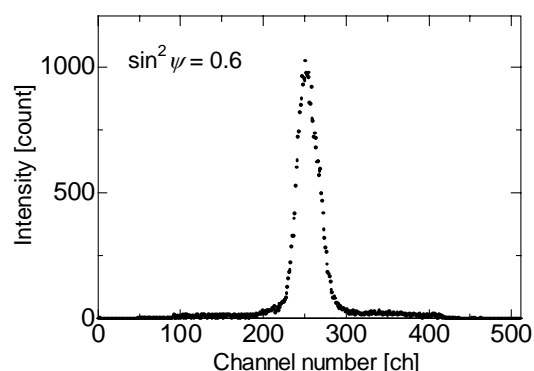
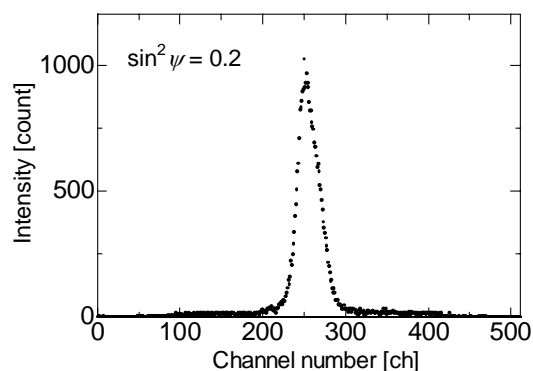
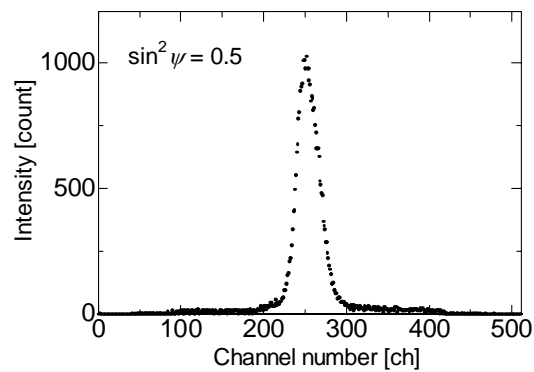
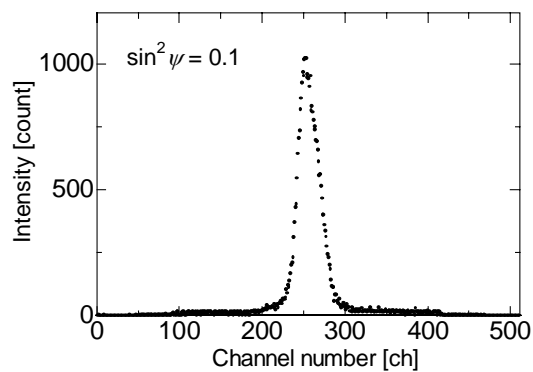
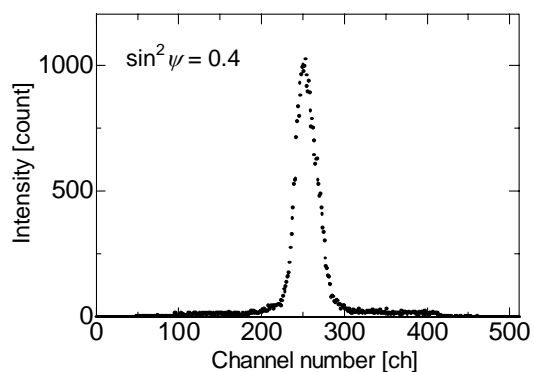
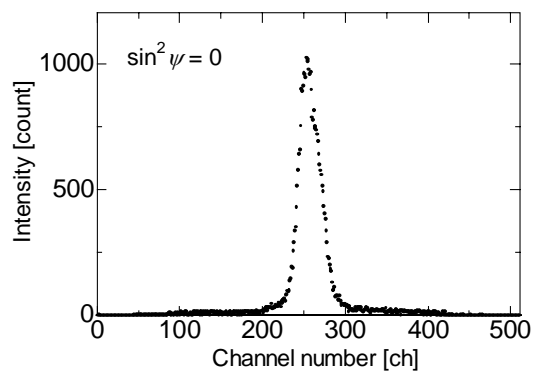
SM570-3 溶接線方向

熱影響部 (x=-10 mm)

$\sin^2 \psi$ 線圖



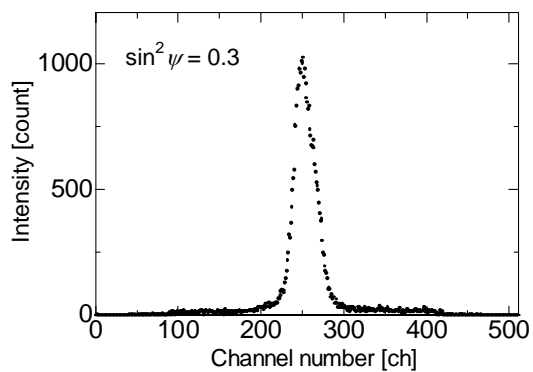
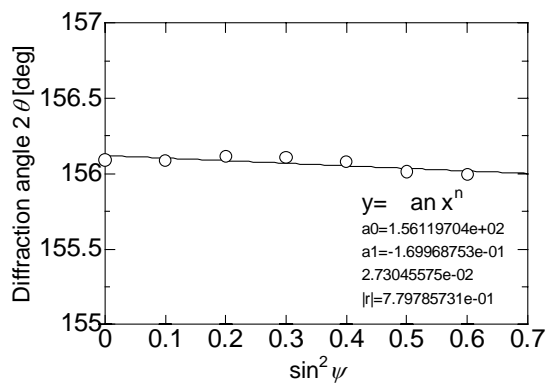
Profile



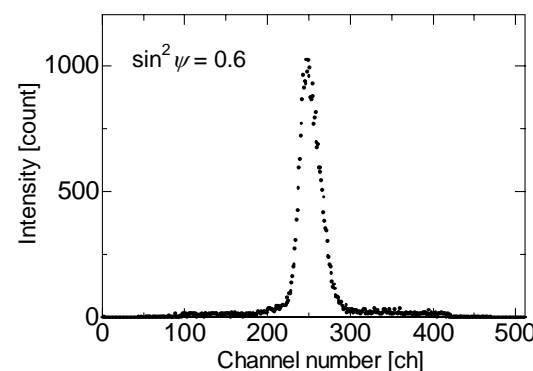
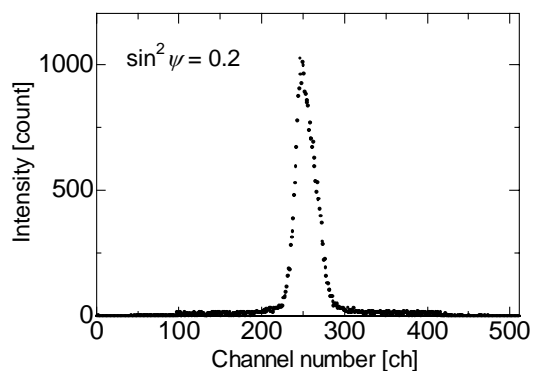
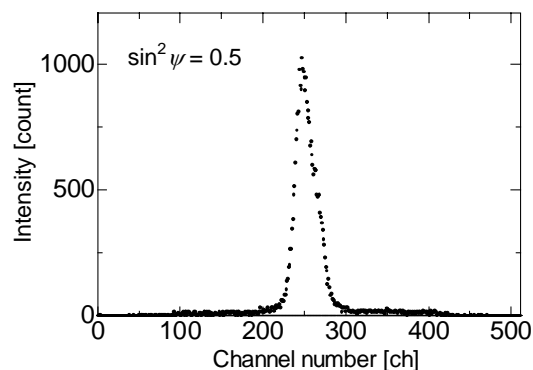
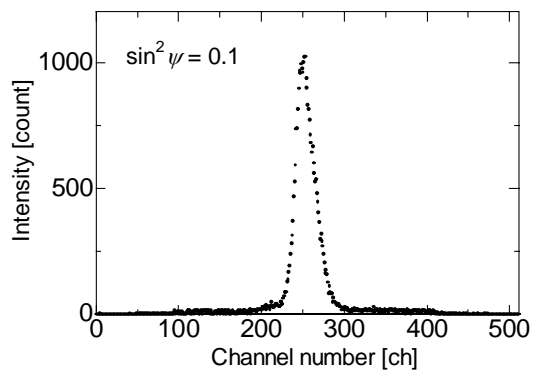
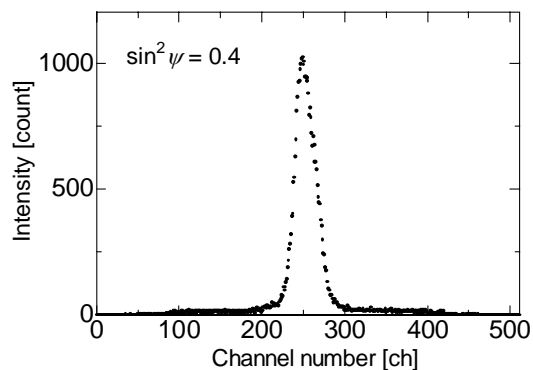
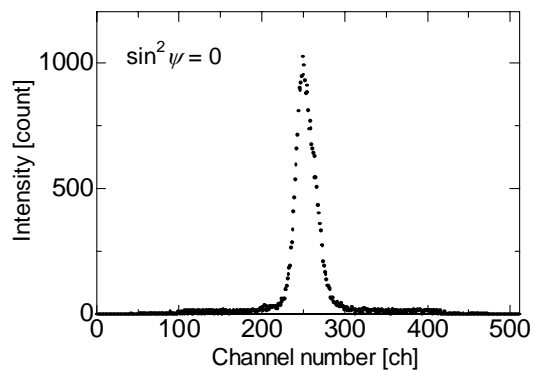
SM570-3 溶接線方向

止端部 (x=-6 mm)

$\sin^2 \psi$ 線図



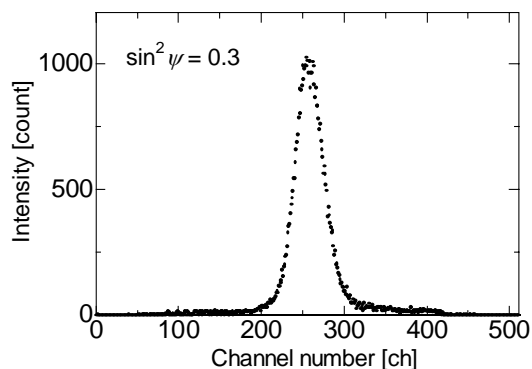
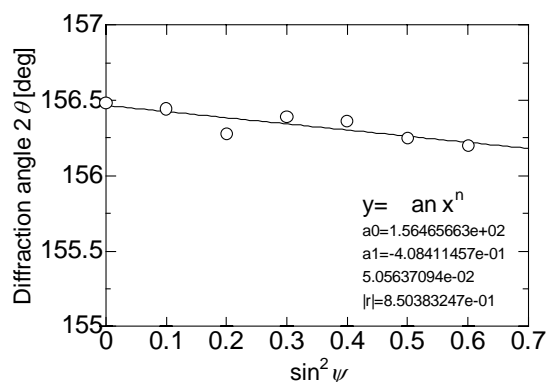
Profile



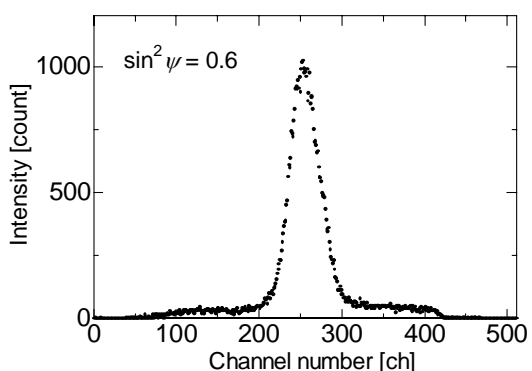
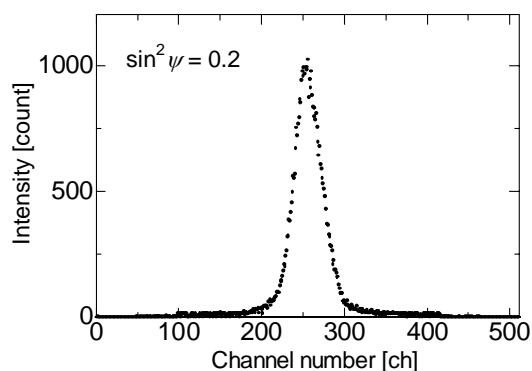
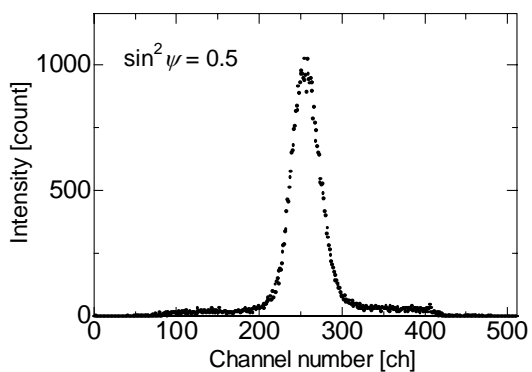
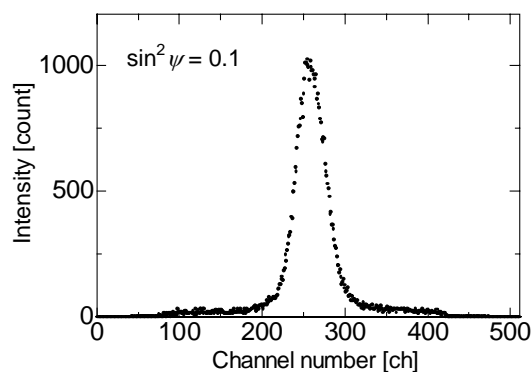
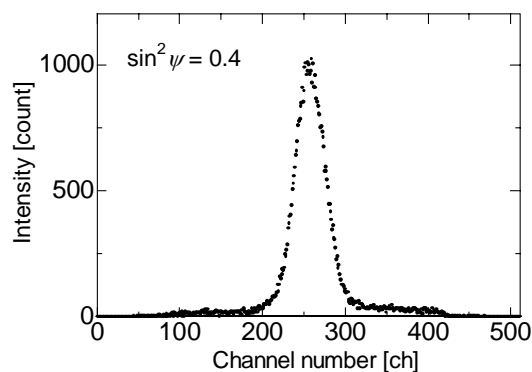
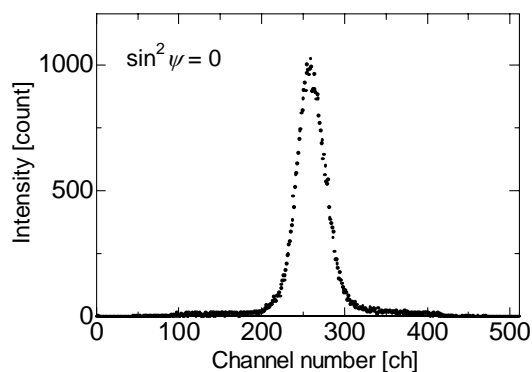
SM570-3 溶接線方向

ヒード部 (x=0 mm)

$\sin^2 \psi$ 線図



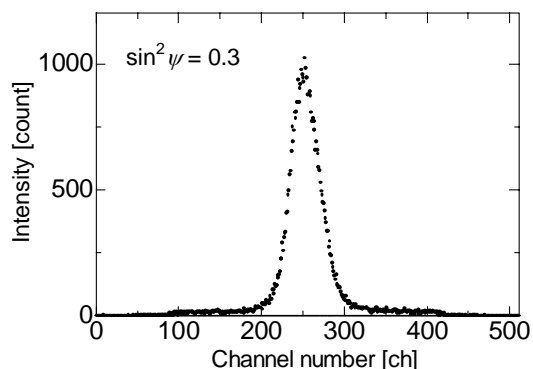
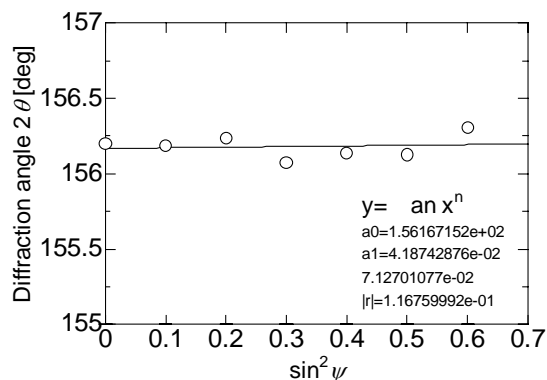
Profile



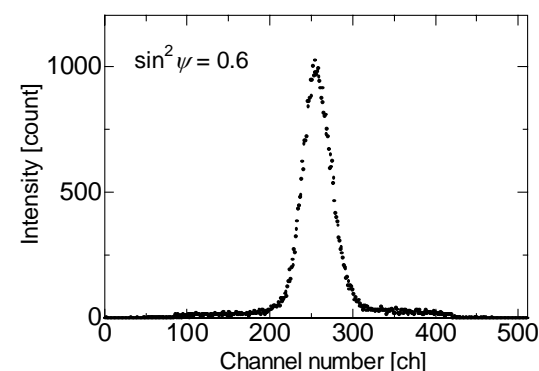
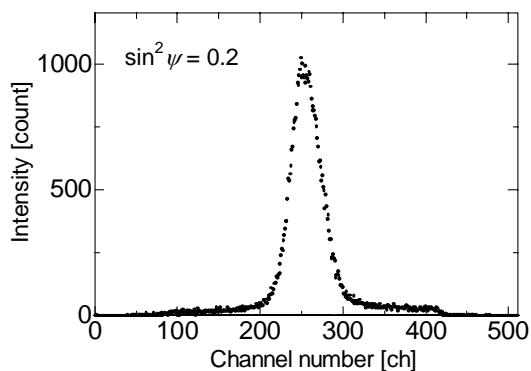
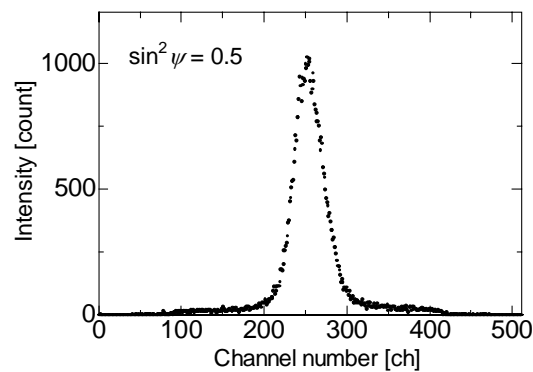
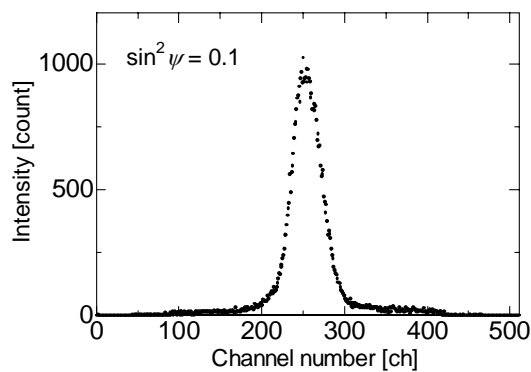
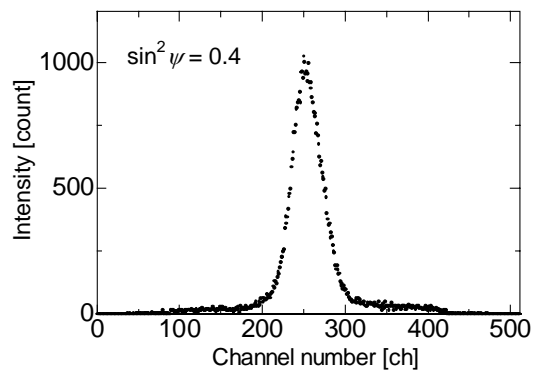
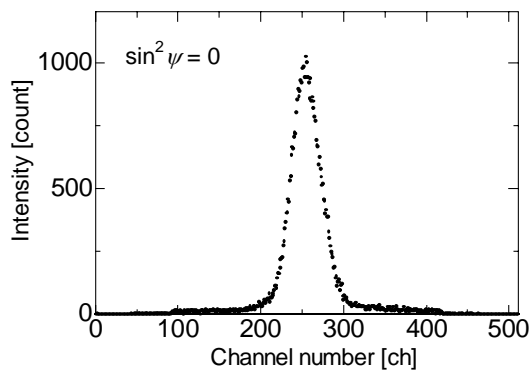
SM570-3 溶接線方向

止端部 (x=6 mm)

$\sin^2 \psi$ 線図



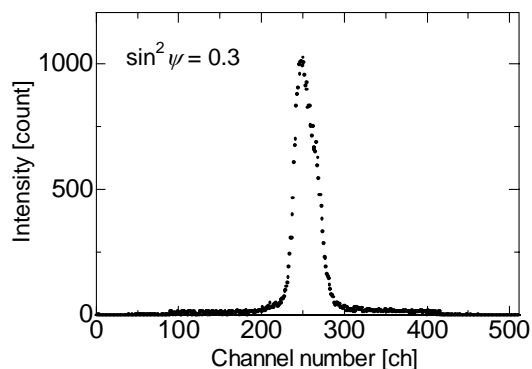
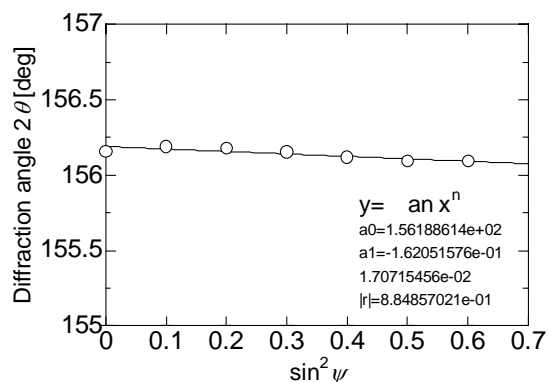
Profile



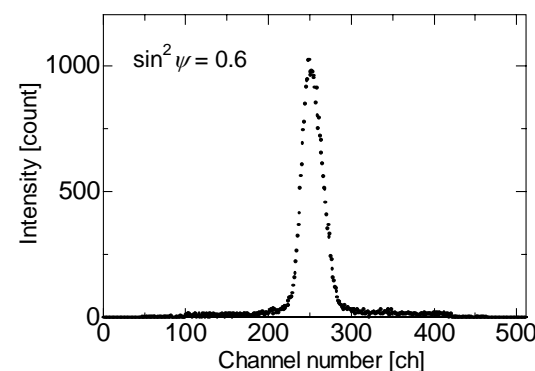
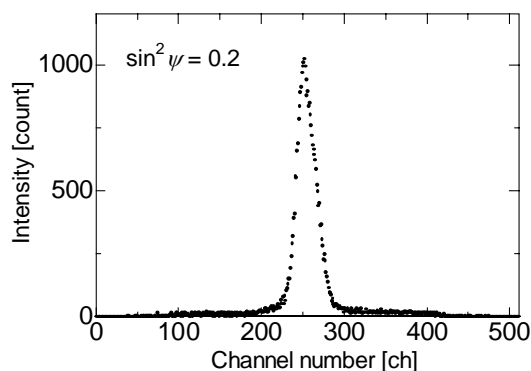
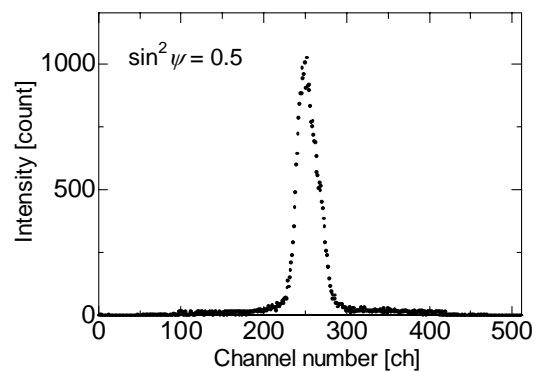
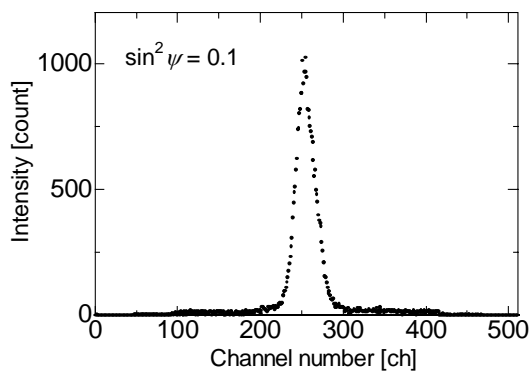
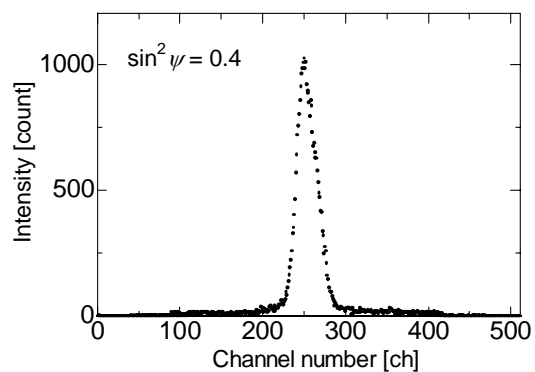
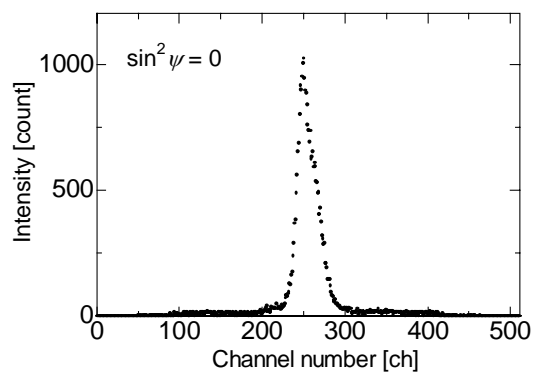
SM570-3 溶接線方向

熱影響部 (x=10 mm)

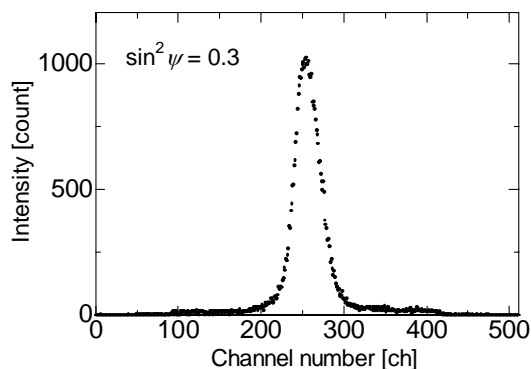
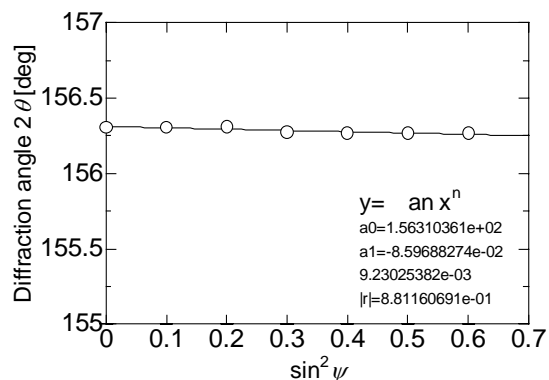
$\sin^2 \psi$ 線圖



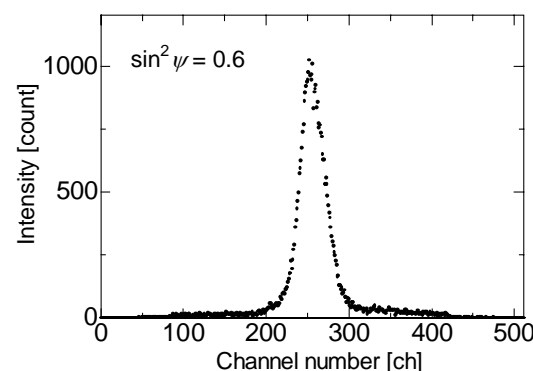
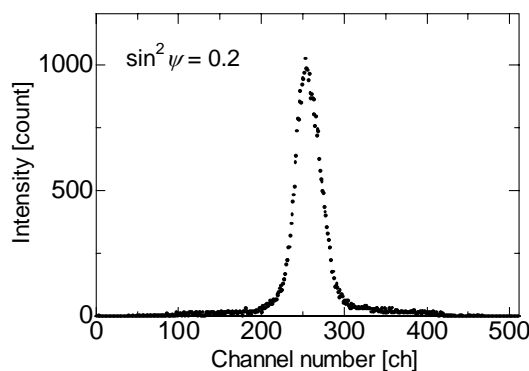
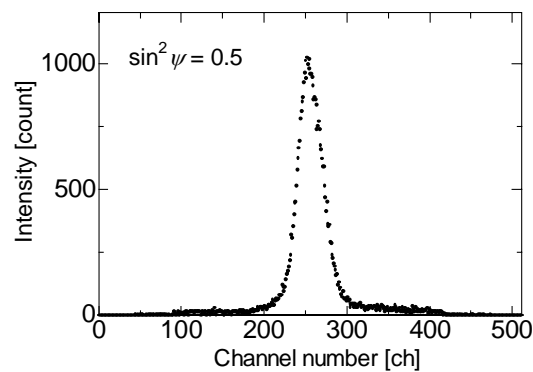
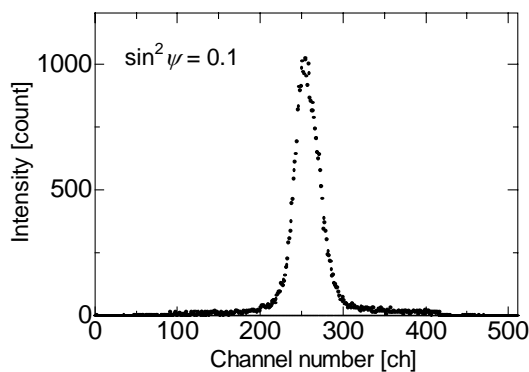
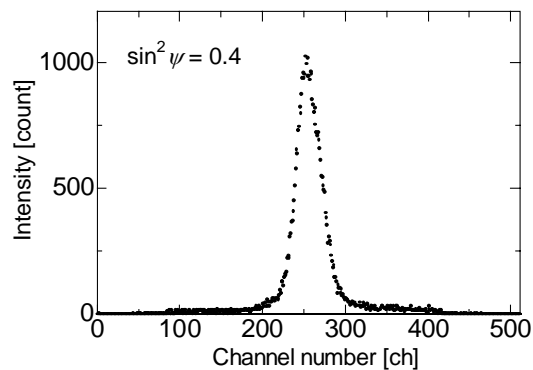
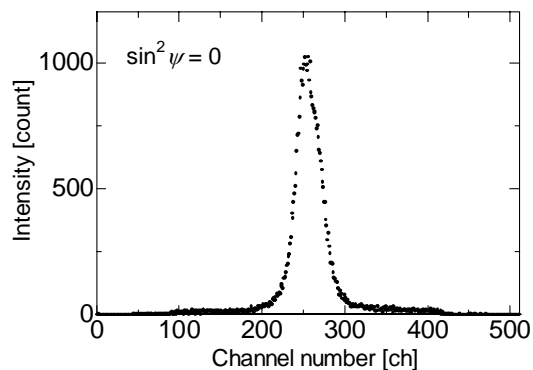
Profile



$\sin^2 \psi$ 線図

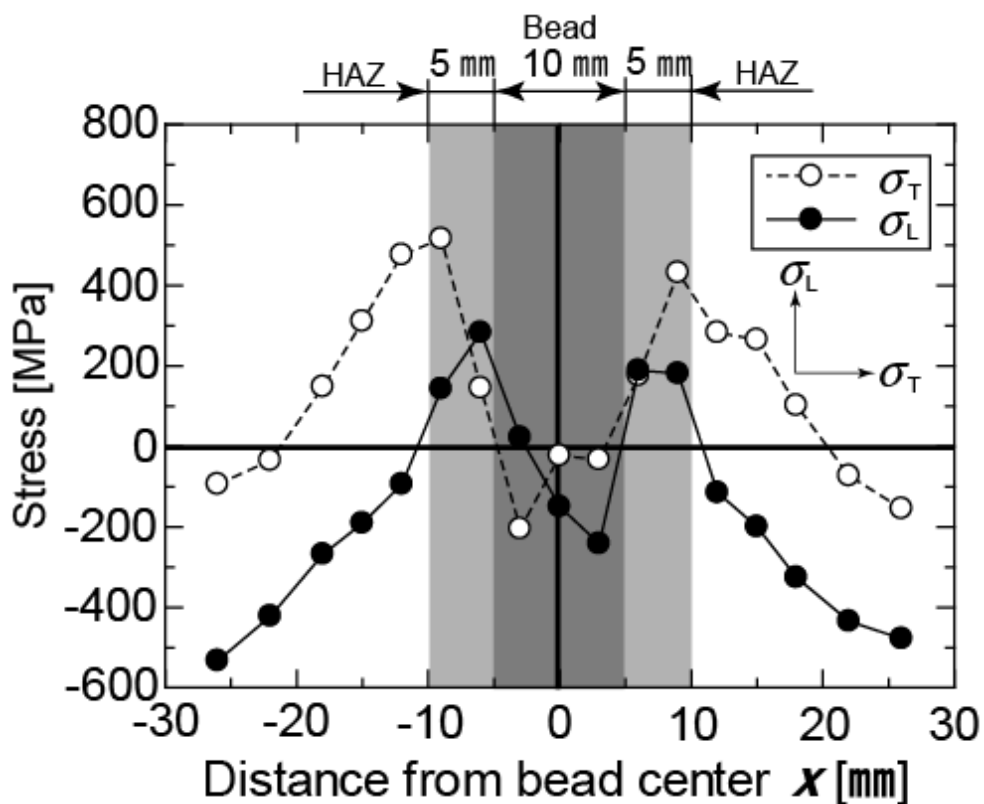


Profile



SUUS304-3 測定結果

ラウンドロビン残留応力測定結果 (SUS304-3_Mn)



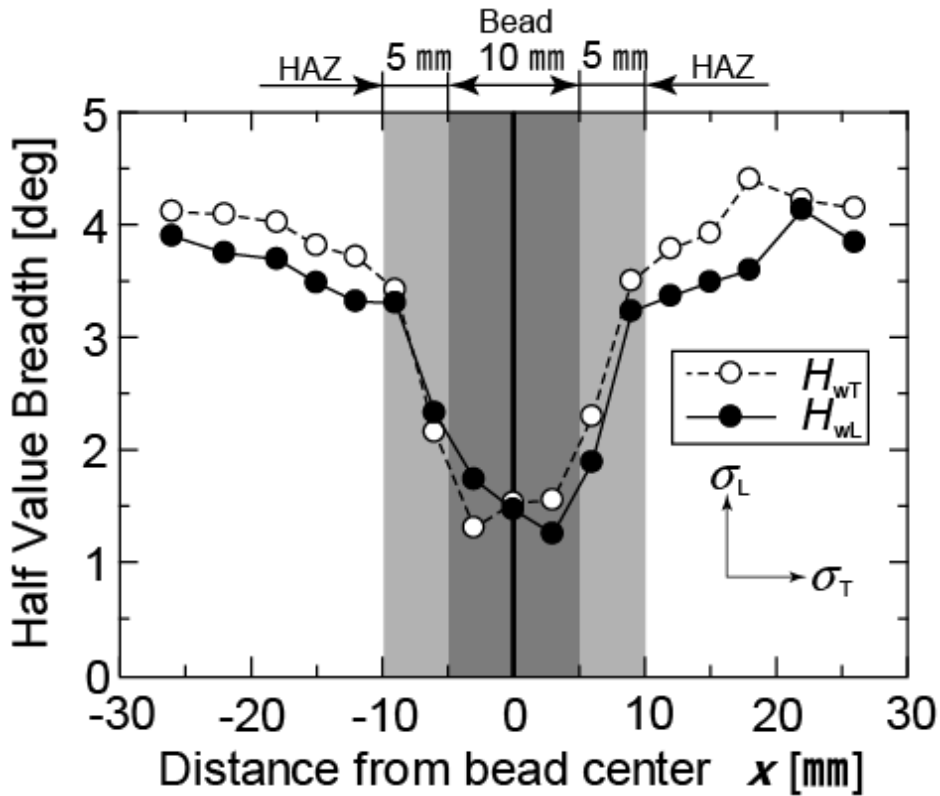
溶接線直角方向

x [mm]	σ_T [MPa]	σ_T [MPa]
-26	-94	19
-22	-35	18
-18	148	16
-15	311	15
-12	476	51
-9	516	52
-6	145	22
-3	-205	158
0	-23	115
3	-33	85
6	176	25
9	432	27
12	283	11
15	265	38
18	102	76
22	-73	17
26	-155	29

溶接線方向

x [mm]	σ_L [MPa]	σ_L [MPa]
-26	-533	27
-22	-422	22
-18	-268	32
-15	-191	21
-12	-94	14
-9	143	27
-6	283	17
-3	22	62
0	-150	104
3	-242	183
6	189	52
9	181	18
12	-115	17
15	-200	22
18	-326	18
22	-435	13
26	-478	40

ラウンドロビン半価幅分布 (SUS304-3_Mn)



各点は、半価幅平均値

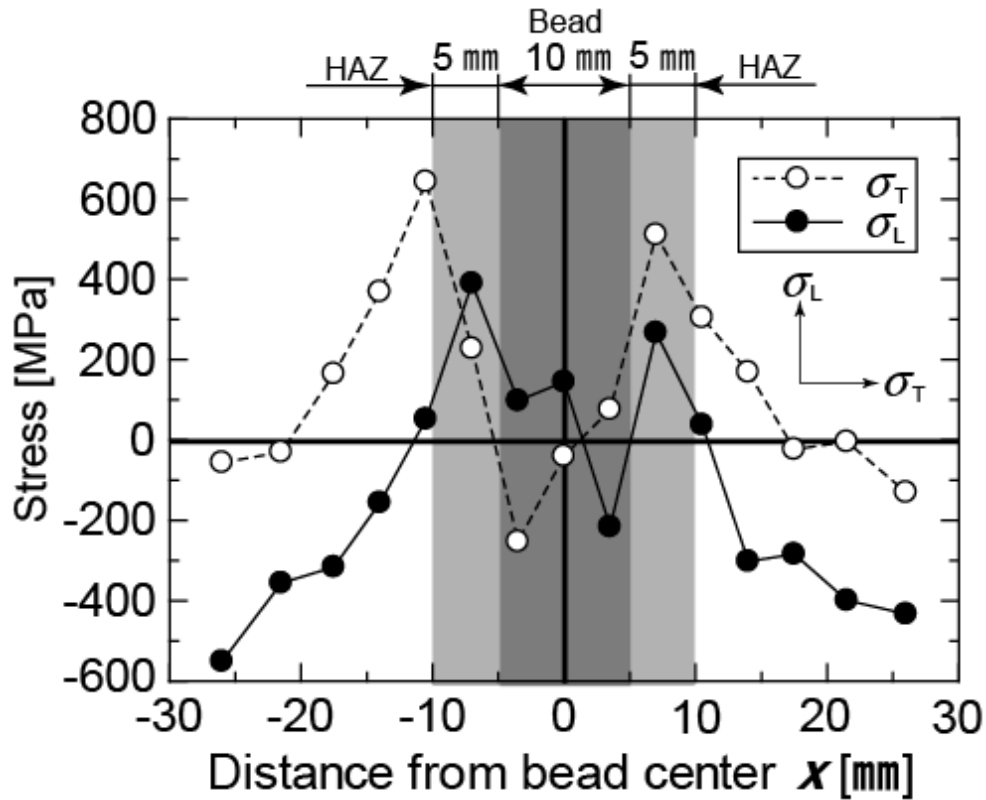
溶接線直角方向

x [mm]	HVB [deg]
-26	4.116
-22	4.090
-18	4.019
-15	3.813
-12	3.714
-9	3.420
-6	2.155
-3	1.304
0	1.526
3	1.550
6	2.294
9	3.498
12	3.784
15	3.923
18	4.403
22	4.220
26	4.145

溶接線方向

x [mm]	HVB [deg]
-26	3.898
-22	3.747
-18	3.692
-15	3.482
-12	3.316
-9	3.303
-6	2.326
-3	1.734
0	1.466
3	1.251
6	1.887
9	3.228
12	3.364
15	3.487
18	3.594
22	4.132
26	3.841

ラウンドロビン残留応力測定結果 (SUS304-3_Cr)



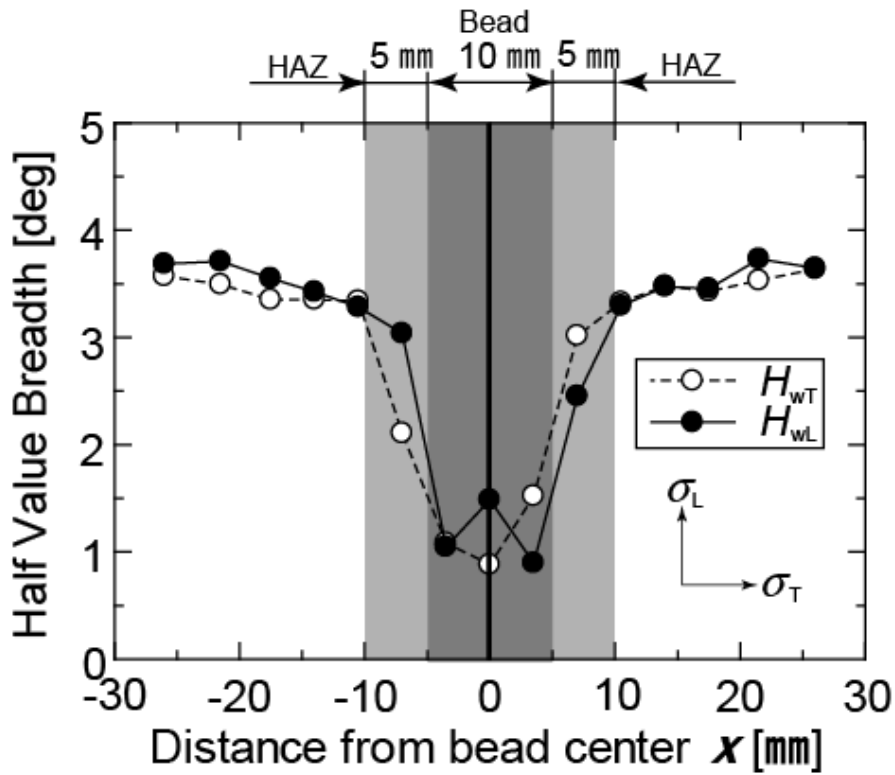
溶接線直角方向

x [mm]	σ_T [MPa]	σ_T [MPa]
-26	-56	131
-21.5	-30	76
-17.5	165	47
-14	369	61
-10.5	643	75
-7	228	31
-3.5	-253	172
0	-40	175
3.5	76	132
7	511	36
10.5	305	142
14	169	98
17.5	-23	99
21.5	-4	38
26	-130	157

溶接線方向

x [mm]	σ_L [MPa]	σ_L [MPa]
-26	-551	121
-21.5	-356	86
-17.5	-316	185
-14	-156	85
-10.5	52	80
-7	390	95
-3.5	98	108
0	145	291
3.5	-216	155
7	267	71
10.5	38	79
14	-302	75
17.5	-284	153
21.5	-399	162
26	-433	70

ラウンドロビン半価幅分布 (SUS304-3_Cr)



各点は, 半価幅平均値

溶接線直角方向

x [mm]	HVB [deg]
-26	3.571
-21.5	3.494
-17.5	3.351
-14	3.353
-10.5	3.339
-7	2.107
-3.5	1.083
0	0.881
3.5	1.521
7	3.016
10.5	3.327
14	3.480
17.5	3.429
21.5	3.532
26	3.637

溶接線方向

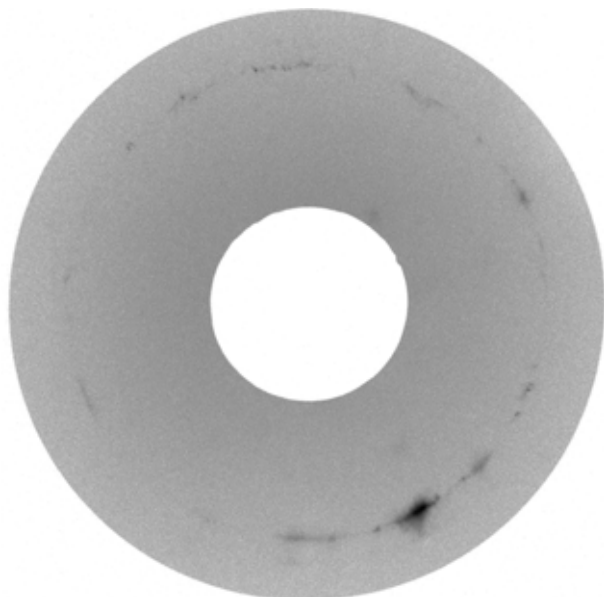
x [mm]	HVB [deg]
-26	3.686
-21.5	3.709
-17.5	3.550
-14	3.425
-10.5	3.282
-7	3.037
-3.5	1.047
0	1.485
3.5	0.896
7	2.452
10.5	3.296
14	3.473
17.5	3.455
21.5	3.731
26	3.647

SUS304-3 回折像

<測定位置 1> の実験結果

ビード中央部の回折像

の部位の回折像を Fig. 1 (1) ~ (4)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



(3) コリメータ径 $\phi 1.5$ mm の回折像



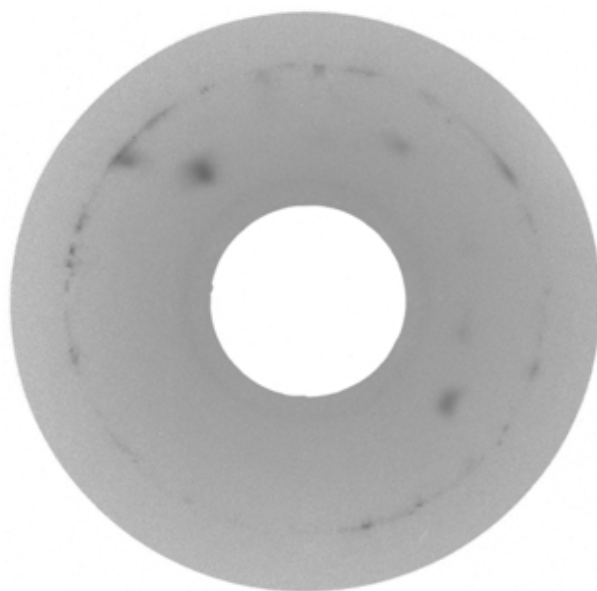
(4) コリメータ径 $\phi 3.0$ mm の回折像

Fig. 1 ビード中央部の回折像

<測定位置 1> 測定結果

ビード部 (ビード中央より 3mm)

の部位の回折像を Fig. 2 (1) ~ (4)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



(3) コリメータ径 $\phi 1.5$ mm の回折像



(4) コリメータ径 $\phi 3.0$ mm の回折像

Fig. 2 ビード部 (ビード中央より 3mm) の回折像

<測定位置 1> 測定結果

熱影響部（ビード中央より 6mm）

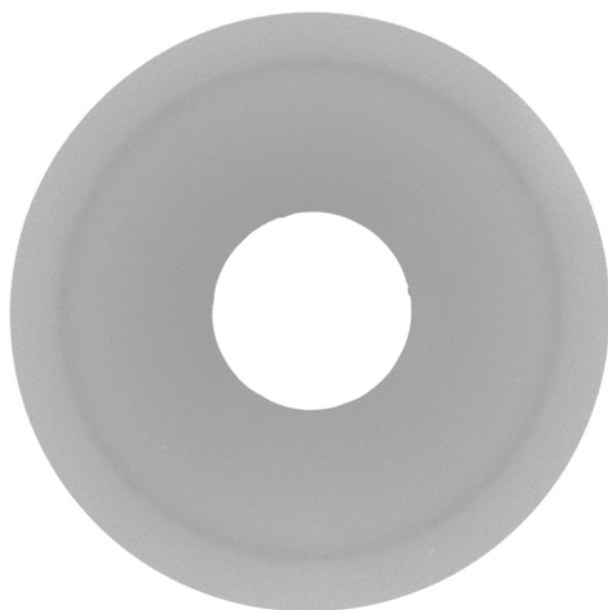
の部位の回折像を Fig. 3 (1) ~ (3)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



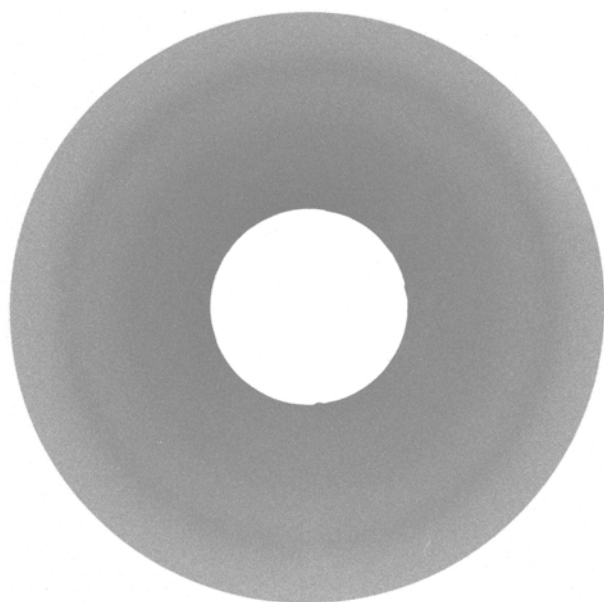
(3) コリメータ径 $\phi 1.5$ mm の回折像

Fig. 3 熱影響部（ビード中央より 6mm）の回折像

<測定位置 1 > 測定結果

熱影響部（ビード中央より 7.5mm）

の部位の回折像を Fig. 4 (1) ~ (4)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



(3) コリメータ径 $\phi 1.5$ mm の回折像



(4) コリメータ径 $\phi 3.0$ mm の回折像

Fig. 4 熱影響部（ビード中央より 7.5mm）の回折像

<測定位置 1 > 測定結果

熱影響部（ビード中央より 9mm）

の部位の回折像を Fig. 5 (1) ~ (4)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



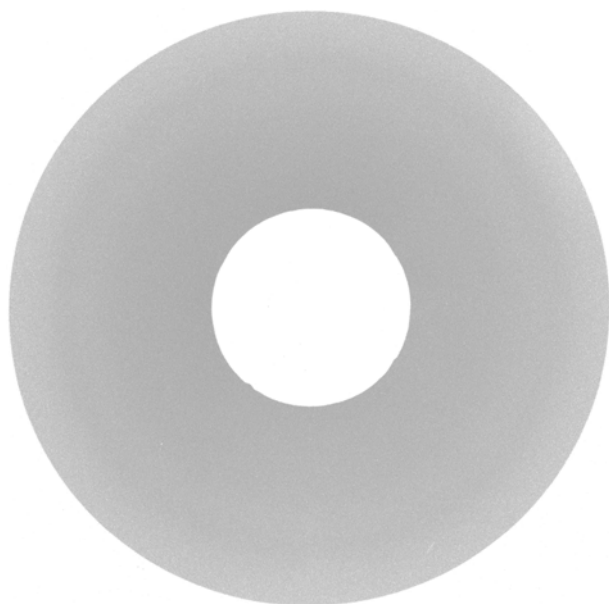
(3) コリメータ径 $\phi 1.5$ mm の回折像

Fig. 5 熱影響部（ビード中央より 9mm）の回折像

<測定位置 1> 測定結果

母材部（ビード中央より 20mm）

の部位の回折像を Fig. 6 (1) ~ (4)に示す .



(1) コリメータ径 $\phi 0.5$ mm の回折像



(2) コリメータ径 $\phi 1.0$ mm の回折像



(3) コリメータ径 $\phi 1.5$ mm の回折像



(4) コリメータ径 $\phi 3.0$ mm の回折像

Fig. 6 母材部（ビード中央より 20mm）の回折像

<測定位置 2> 測定結果

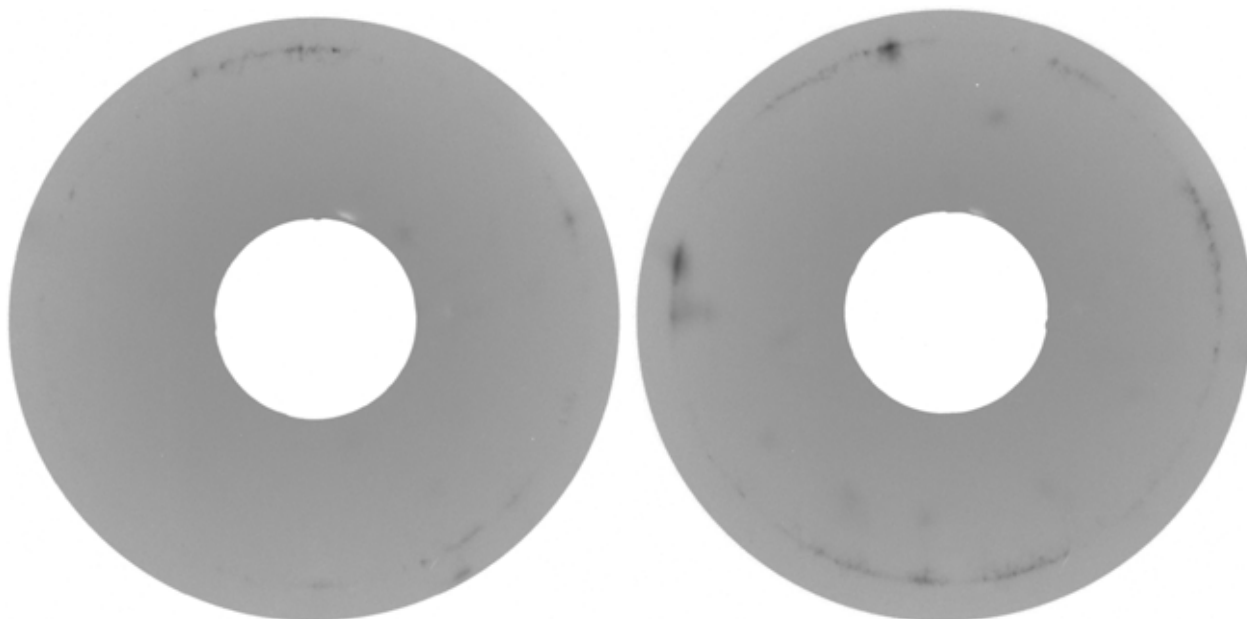
SUS304 パウダー

SUS304 パウダーの回折像を Fig. 7 に示す .



Fig. 7 SUS304 パウダーの回折像

、 (ビード中央部)
、 の部位の回折像を Fig. 12 (1),(2)に示す .



(1) ビード中央部

(2) ビード中央部

Fig. 8 ビード中央部の回折像

<測定位置 2> 測定結果

, 熱影響部

, の部位の回折像を Fig. 9 (1),(2)に示す .



(1) 熱影響部



(2) 熱影響部

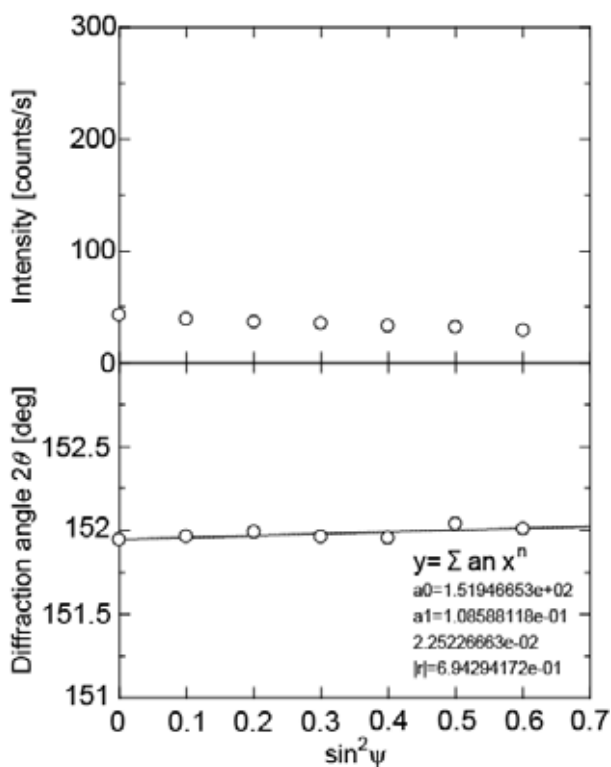
Fig. 9 ビード中央部の回折像

SUS304-3(Mn) 生データ

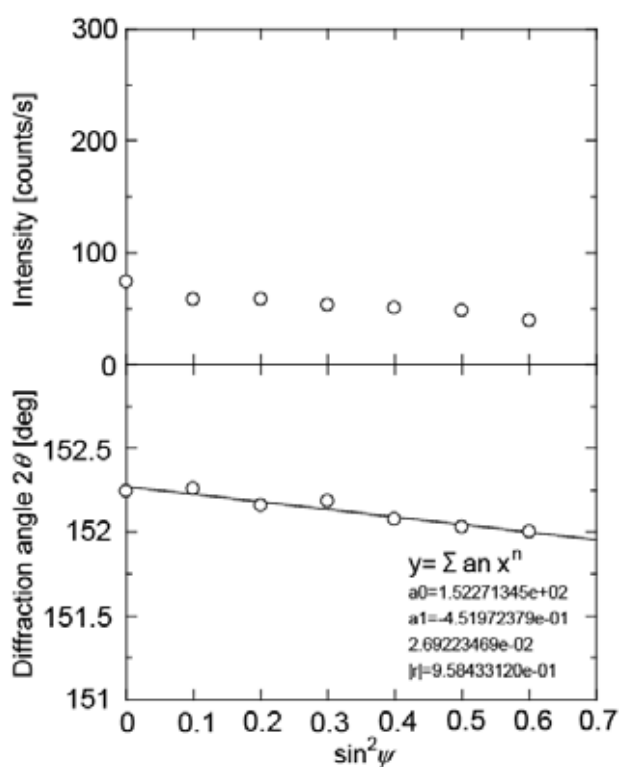
SUS304-3_Mn 溶接線直角方向

Intensity

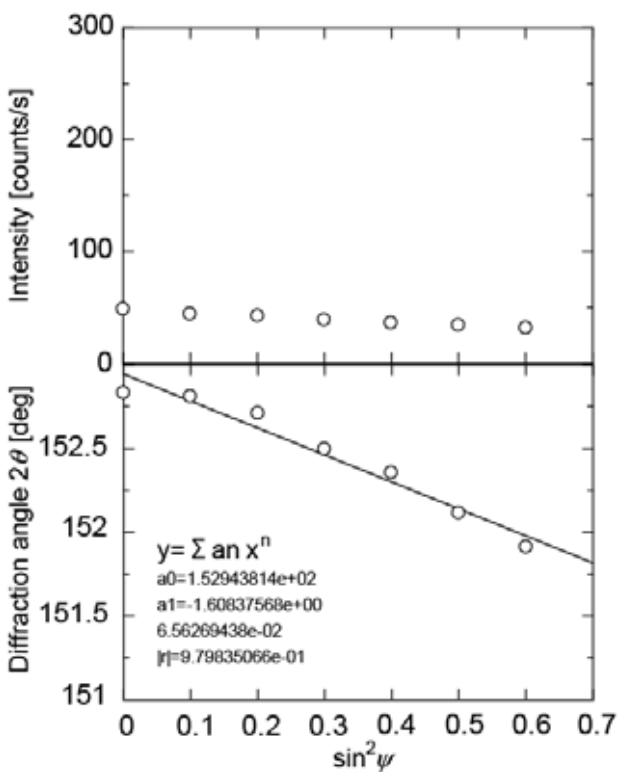
母材部 (x=-22[mm])



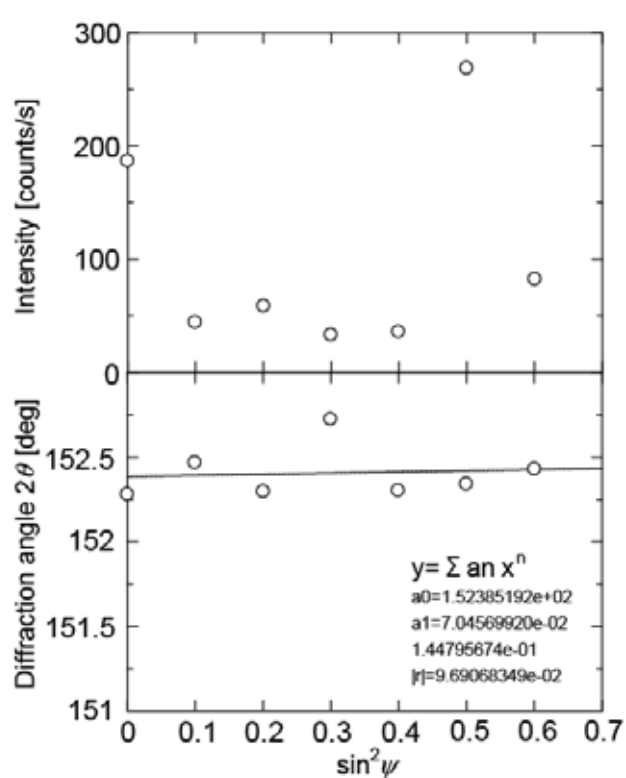
上端部 (x=-6[mm])



熱影響部 (x=-9[mm])

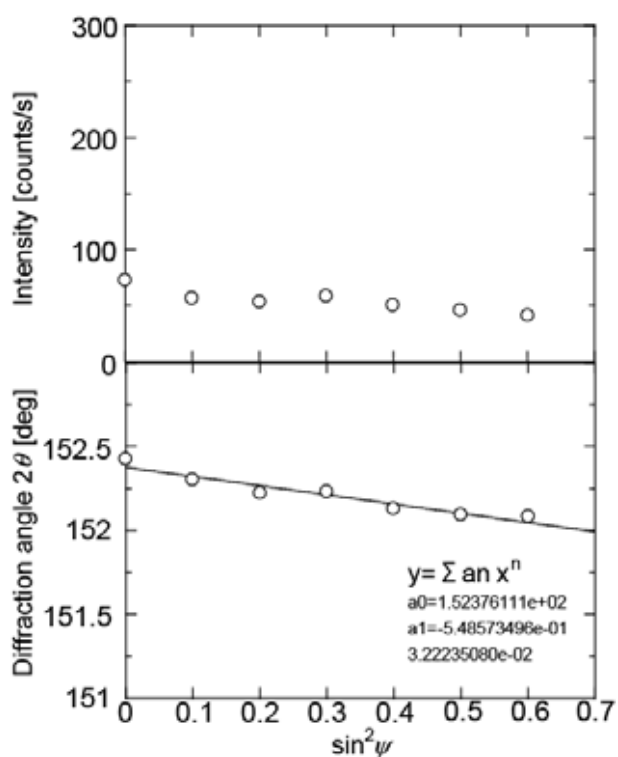


ビード部 (x=0[mm])

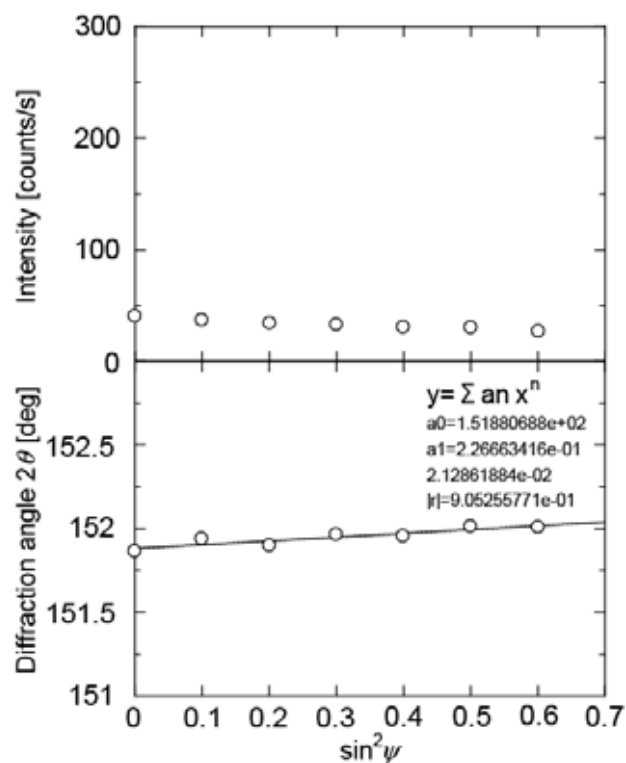


SUS304-3_Mn 溶接線直角方向

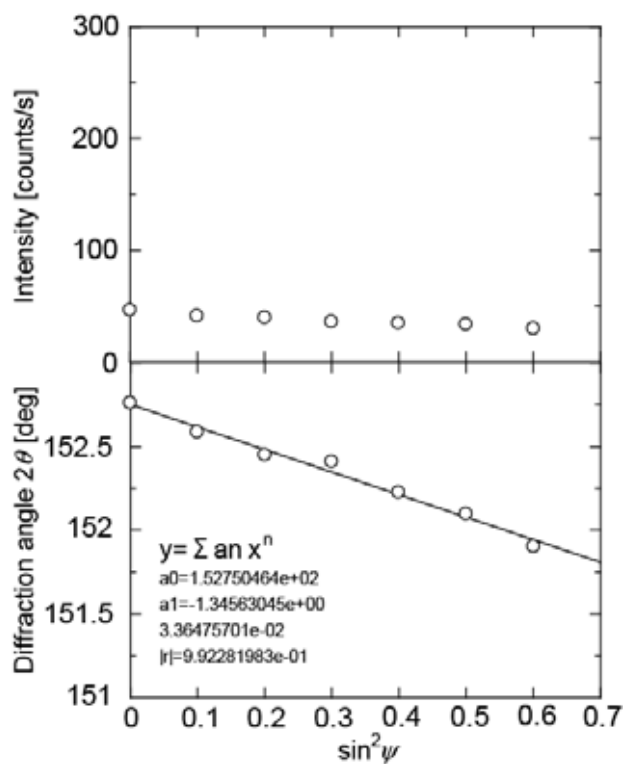
止端部 (x=6[mm])



母材部 (x=22[mm])



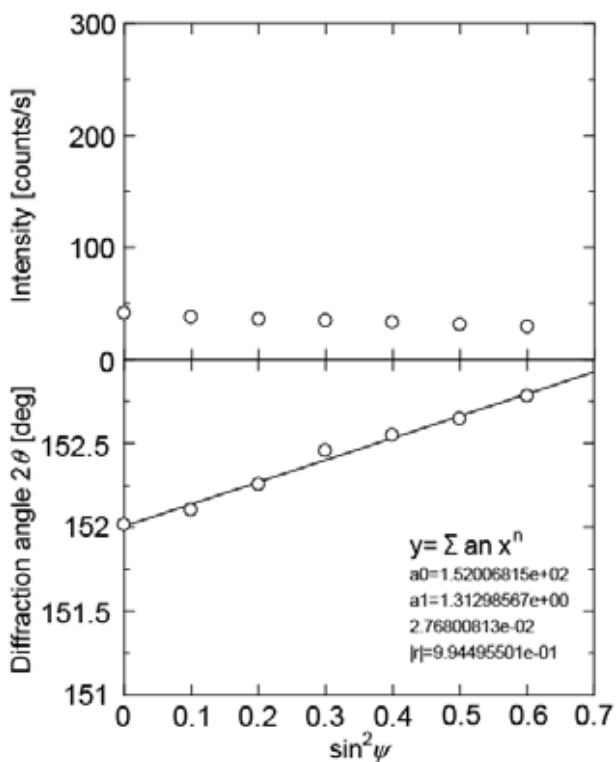
熱影響部 (x=9[mm])



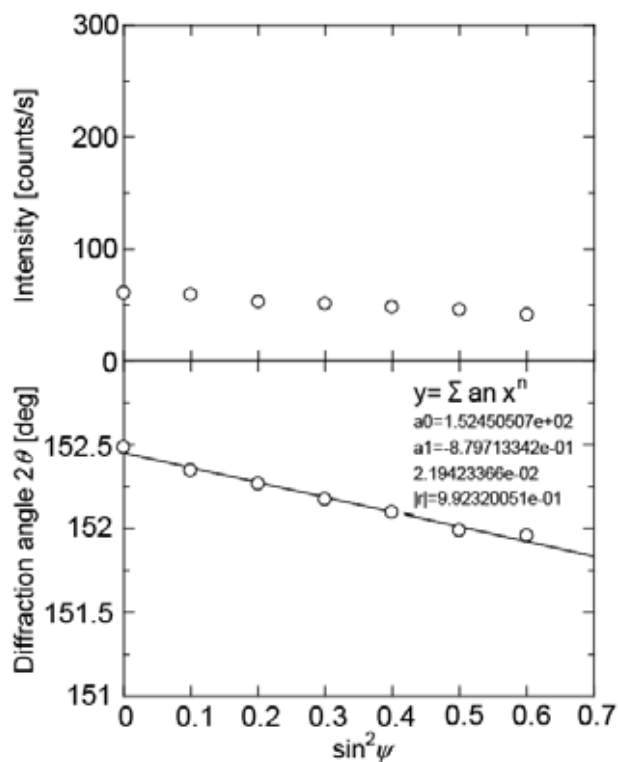
SUS304-3_Mn 溶接線方向

Intensity

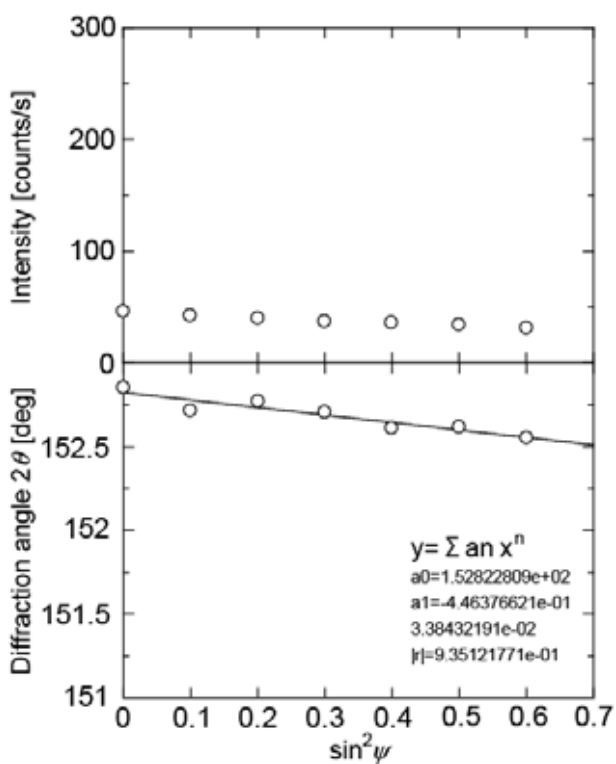
母材部 (x=-22[mm])



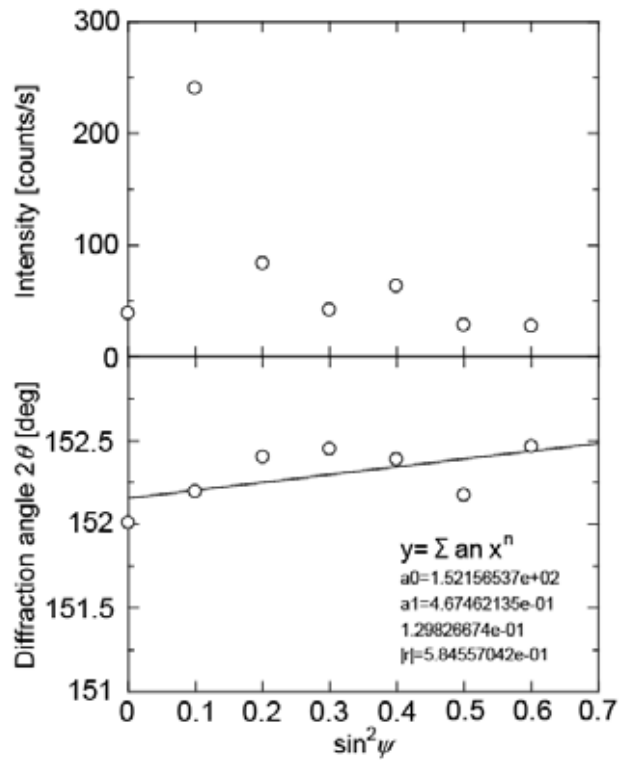
上端部 (x=-6[mm])



熱影響部 (x=-9[mm])

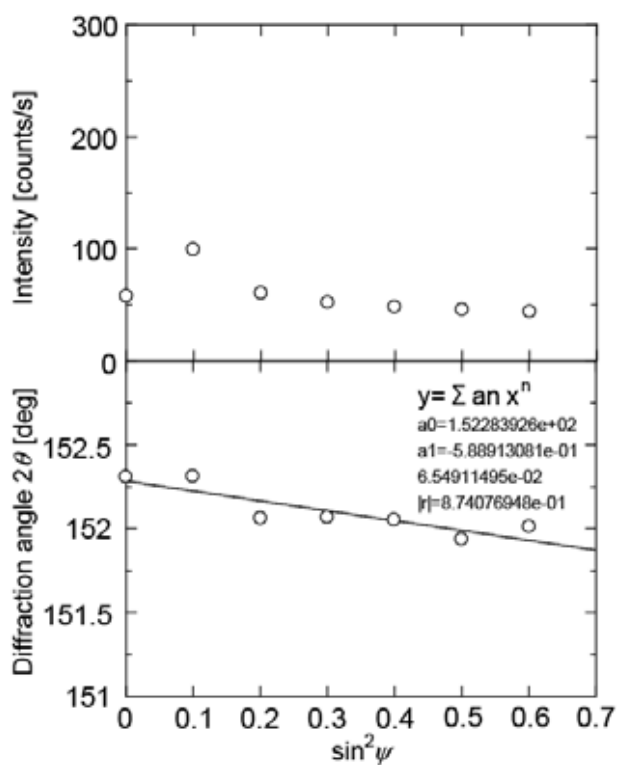


ヒード部 (x=0[mm])

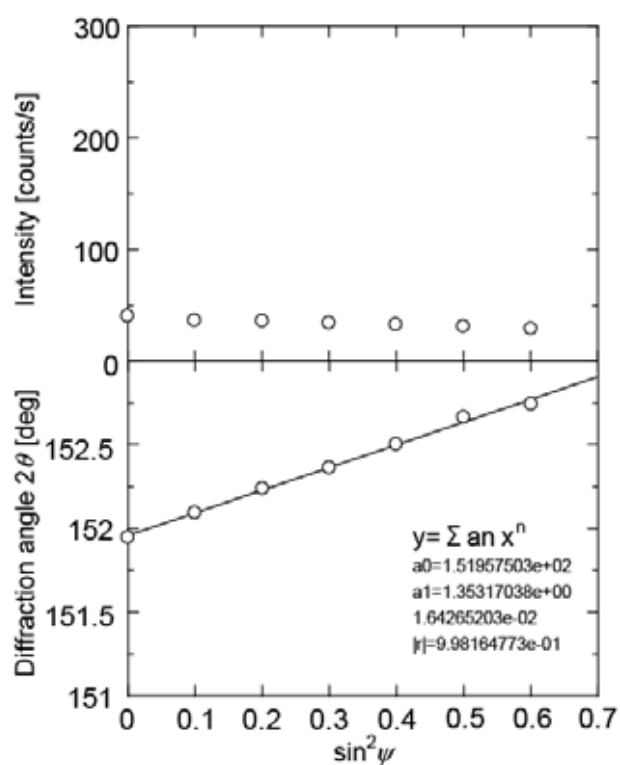


SUS304-3_Mn 溶接線方向

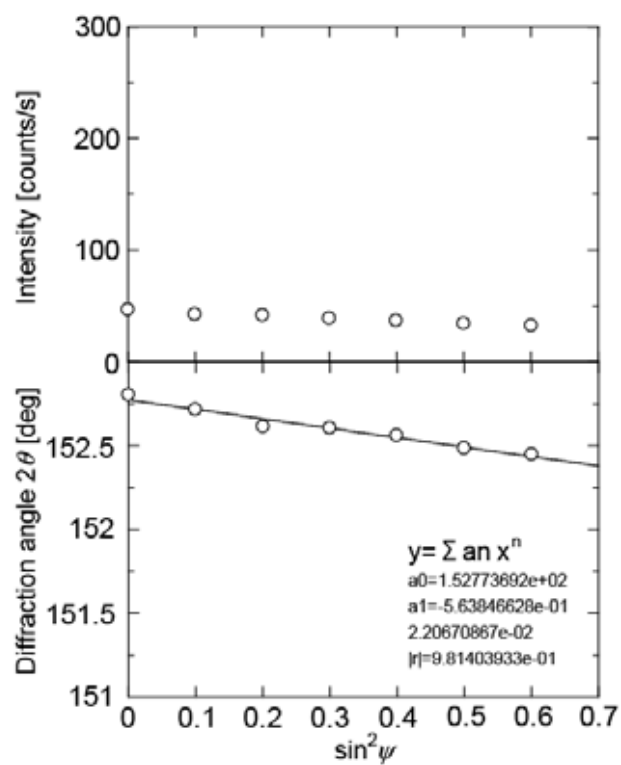
止端部 (x=6[mm])



母材部 (x=22[mm])



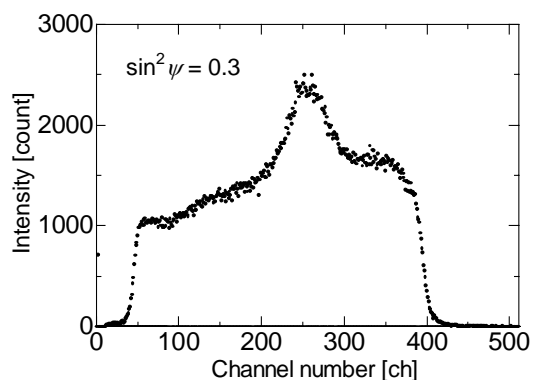
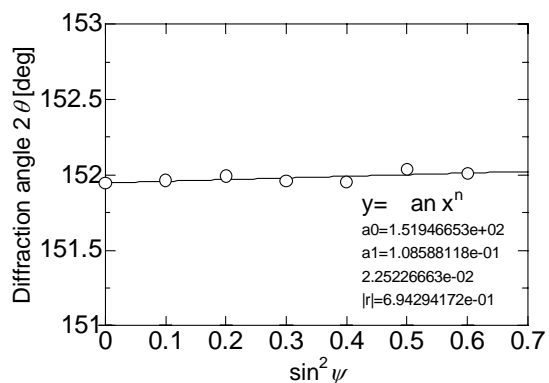
熱影響部 (x=9[mm])



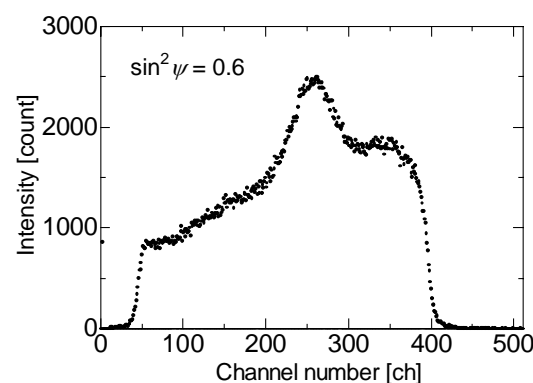
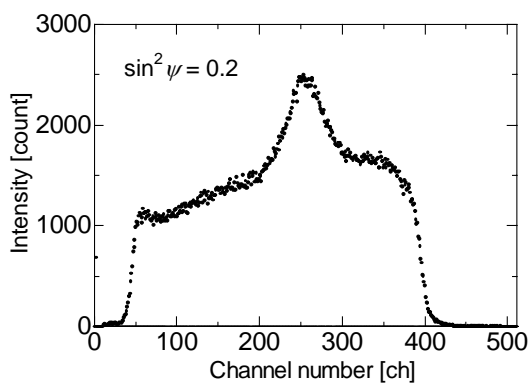
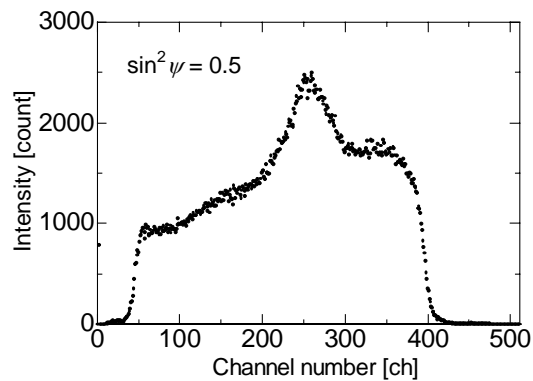
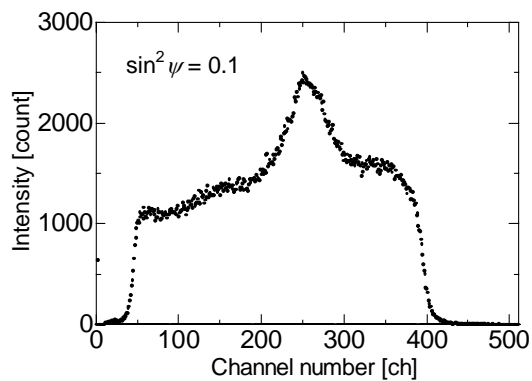
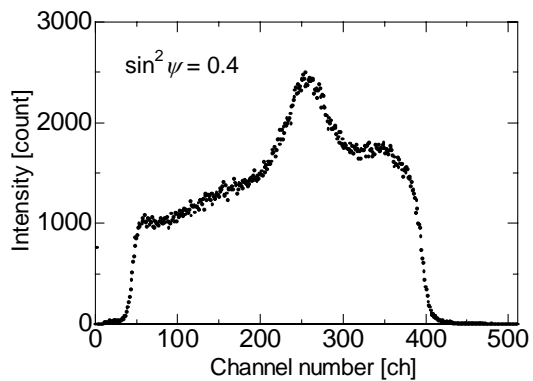
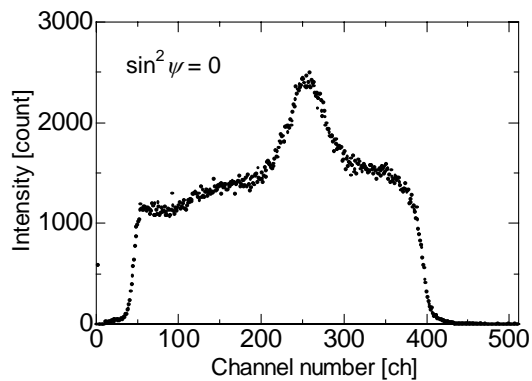
SUS304-3_Mn 溶接線直角方向

母材部 (x=-22 mm)

$\sin^2 \psi$ 線図



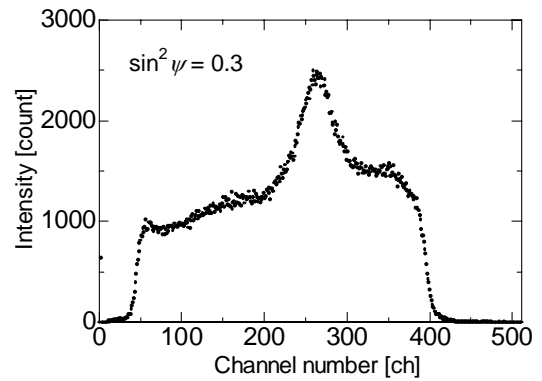
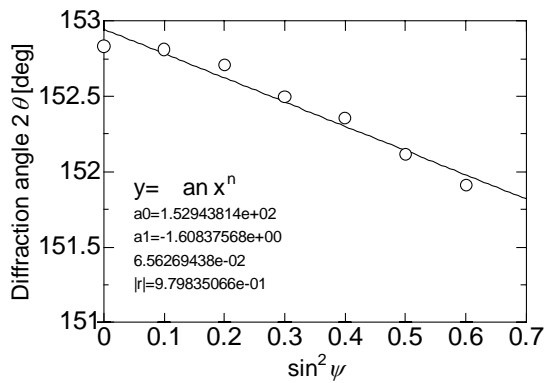
Profile



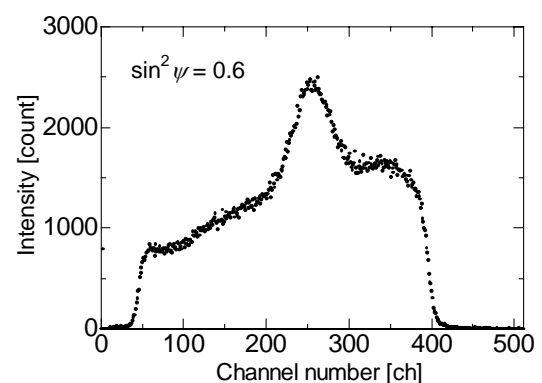
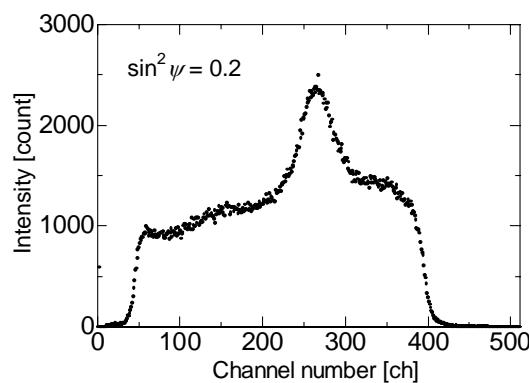
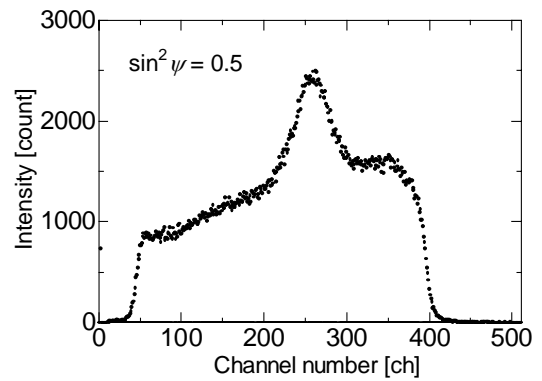
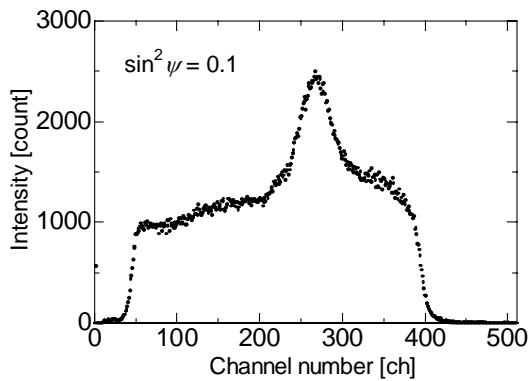
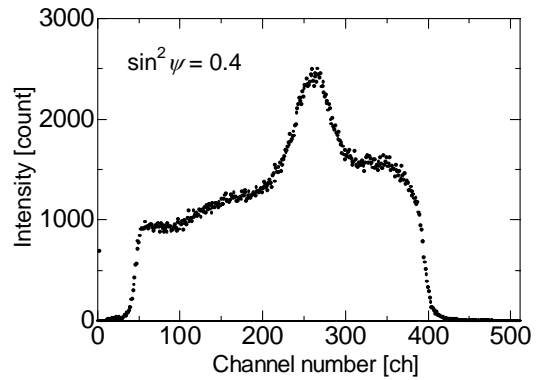
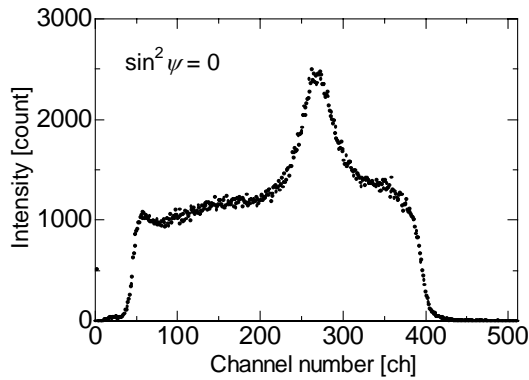
SUS304-3_Mn 溶接線直角方向

熱影響部 (x=-9 mm)

$\sin^2 \psi$ 線圖



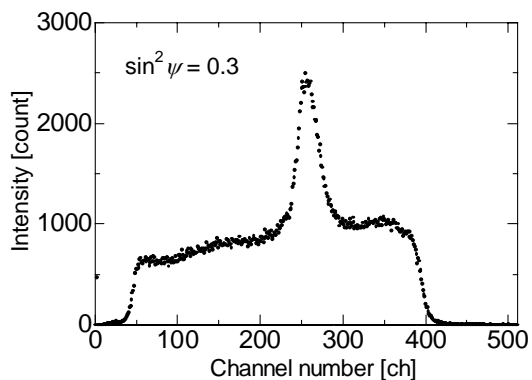
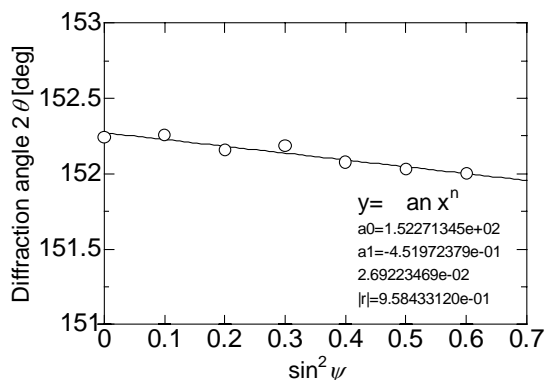
Profile



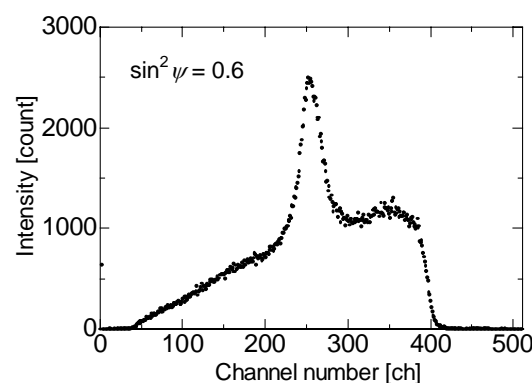
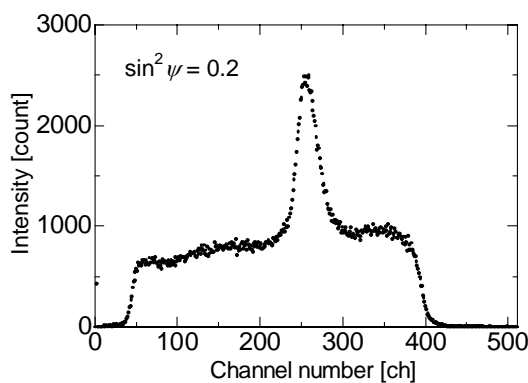
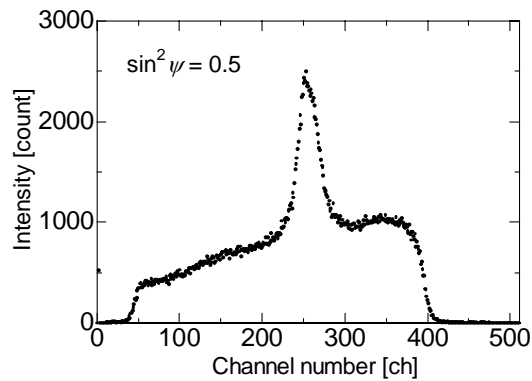
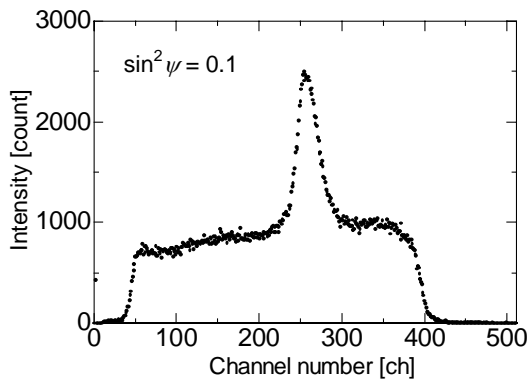
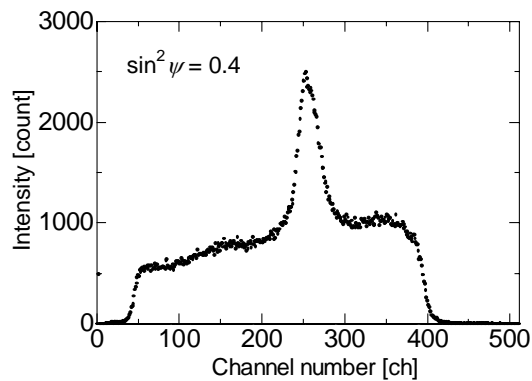
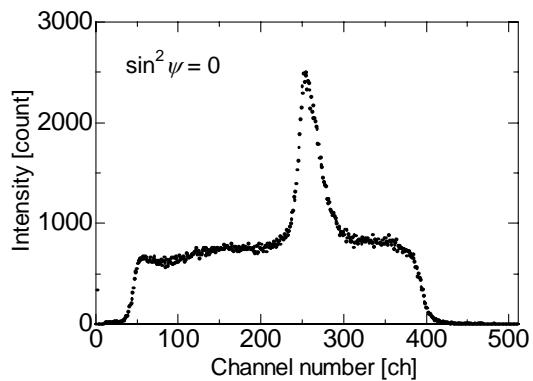
SUS304-3_Mn 溶接線直角方向

止端部 (x=-6 mm)

$\sin^2 \psi$ 線図



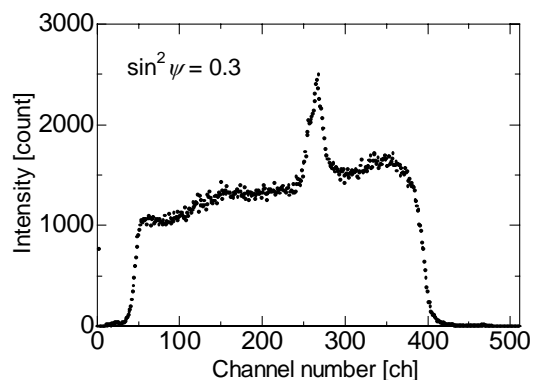
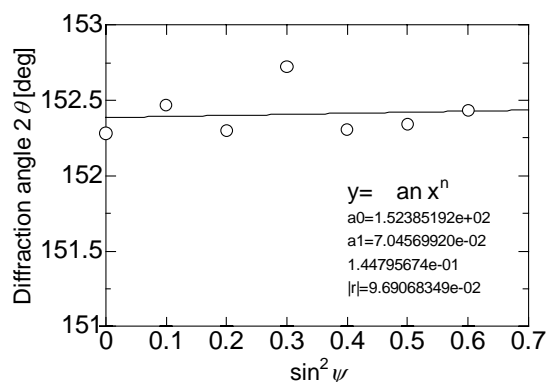
Profile



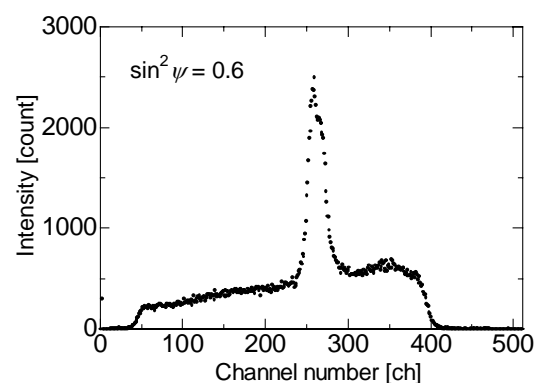
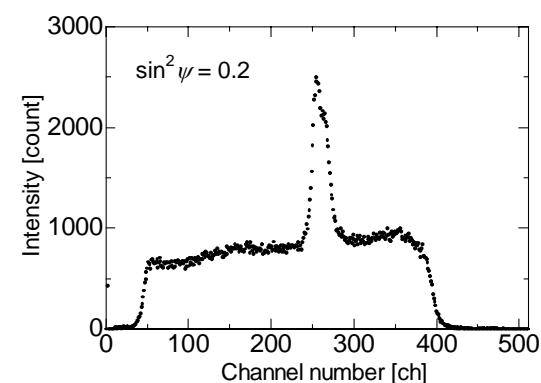
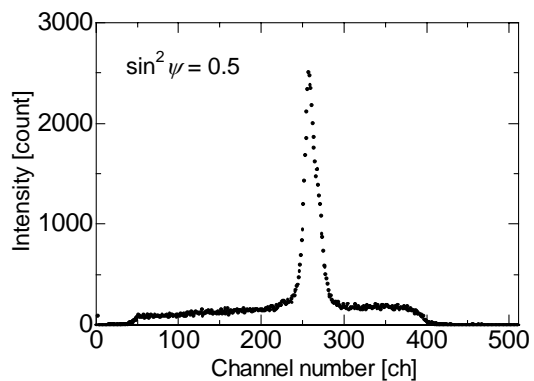
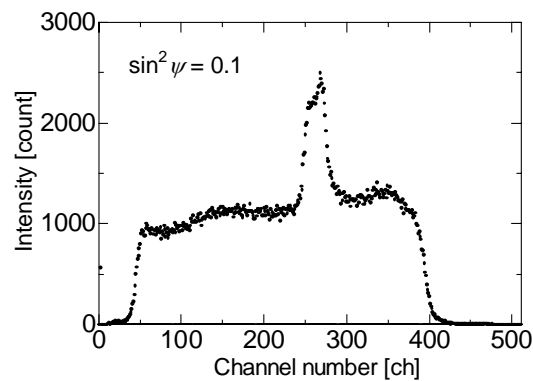
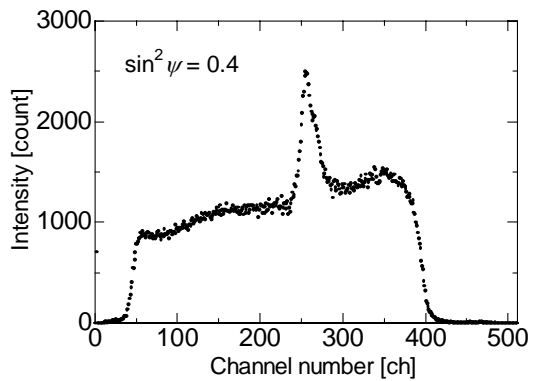
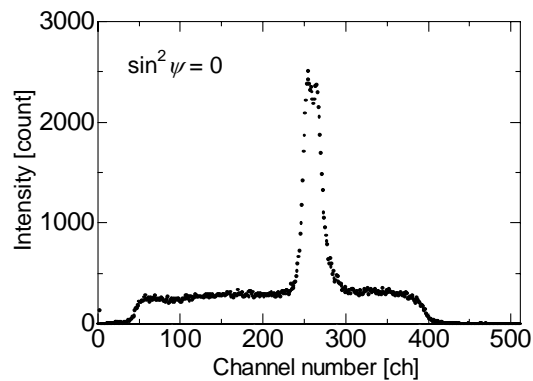
SUS304-3_Mn 溶接線直角方向

ビード部 (x=0 mm)

$\sin^2 \psi$ 線図



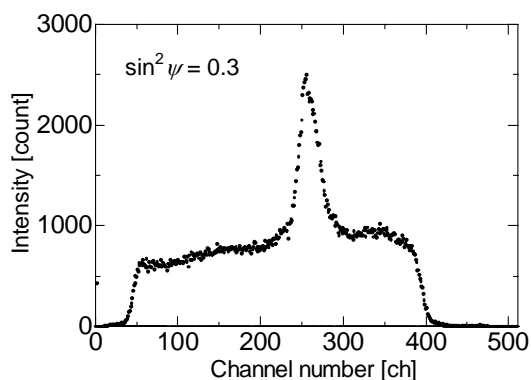
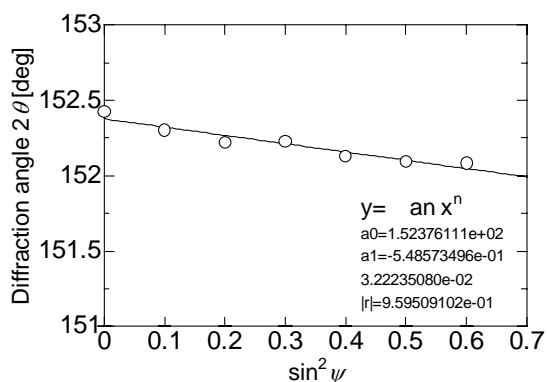
Profile



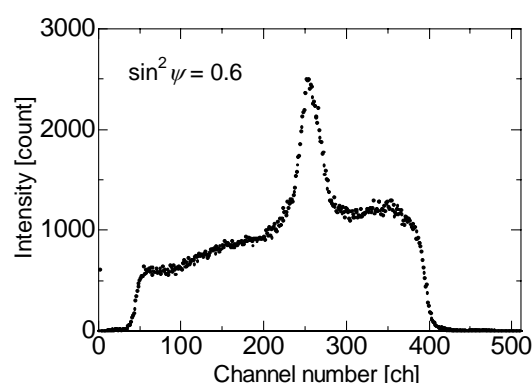
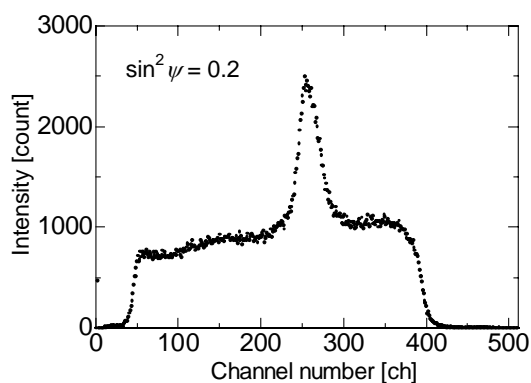
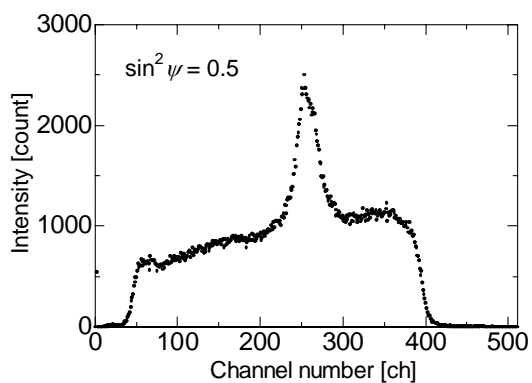
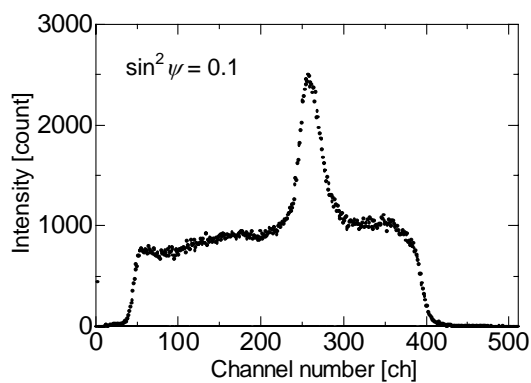
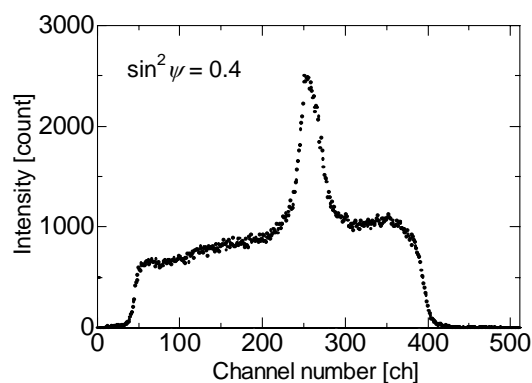
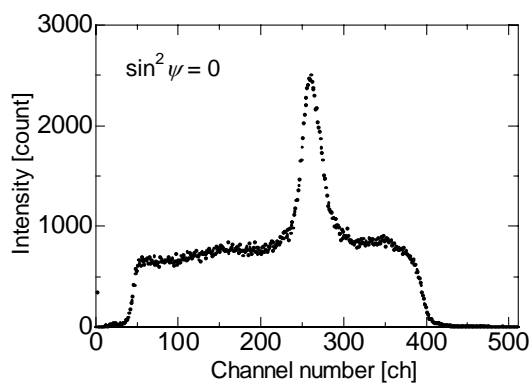
SUS304-3_Mn 溶接線直角方向

止端部 (x=6 mm)

$\sin^2 \psi$ 線図



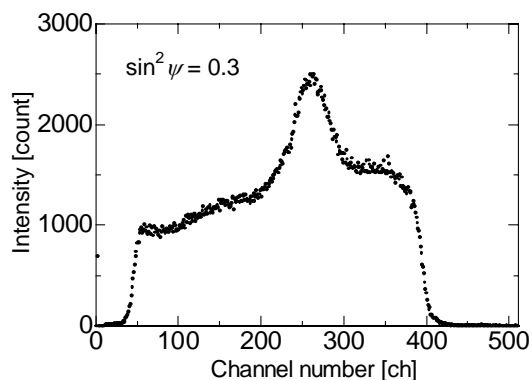
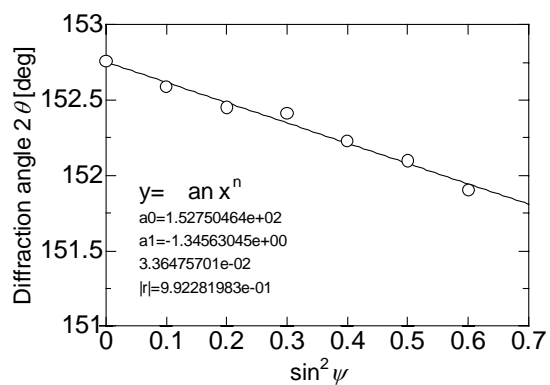
Profile



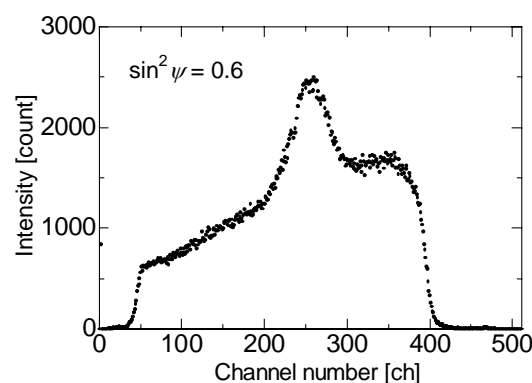
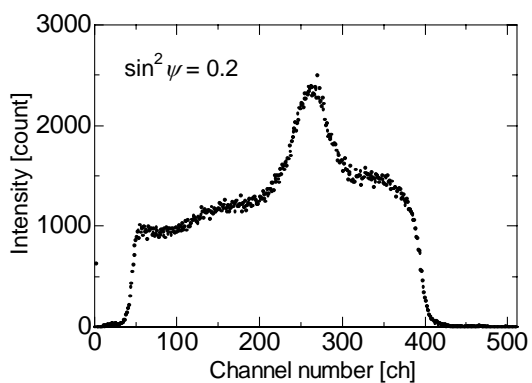
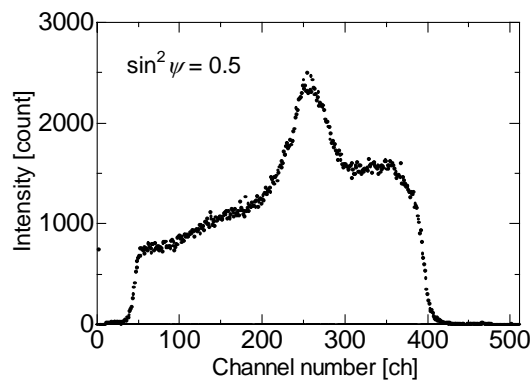
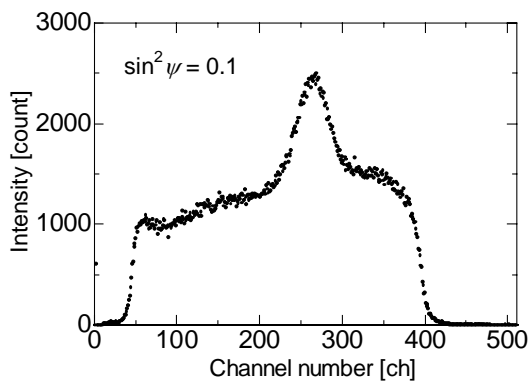
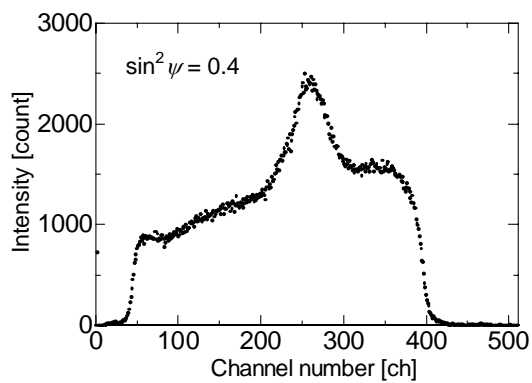
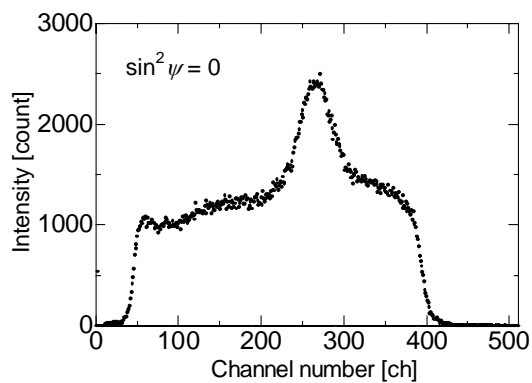
SUS304-3_Mn 溶接線直角方向

熱影響部 (x=9 mm)

$\sin^2 \psi$ 線圖



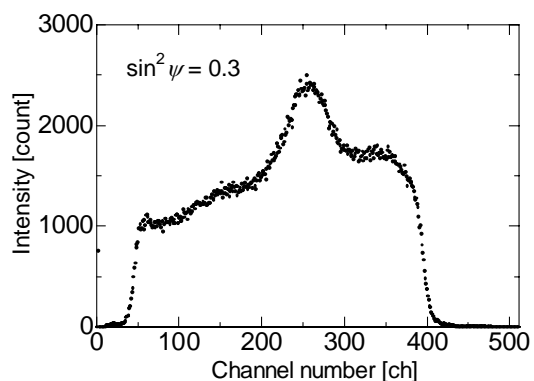
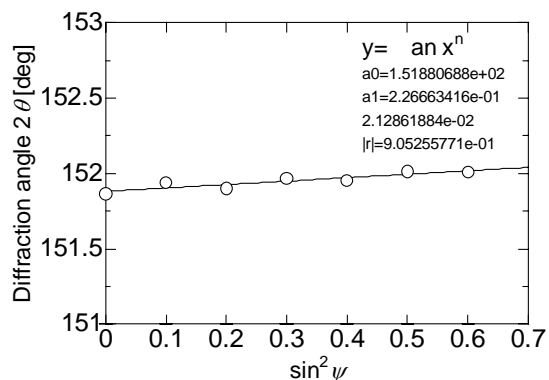
Profile



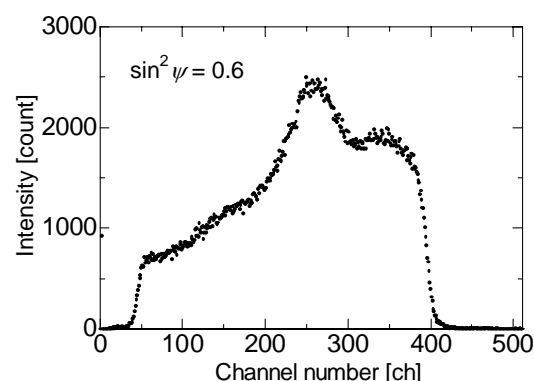
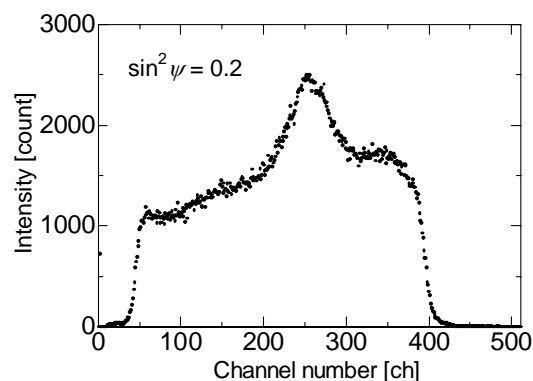
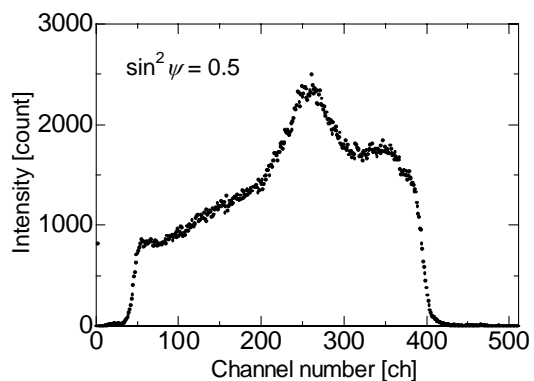
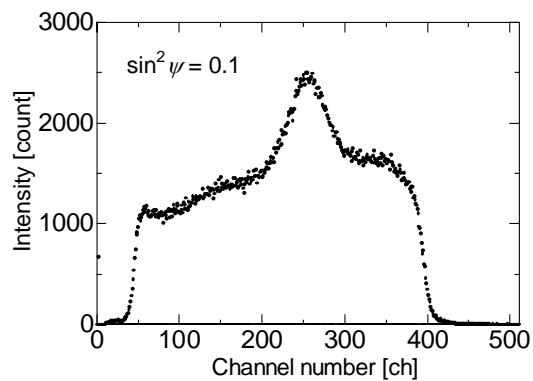
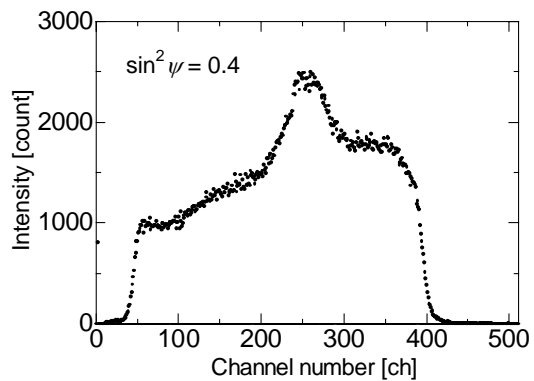
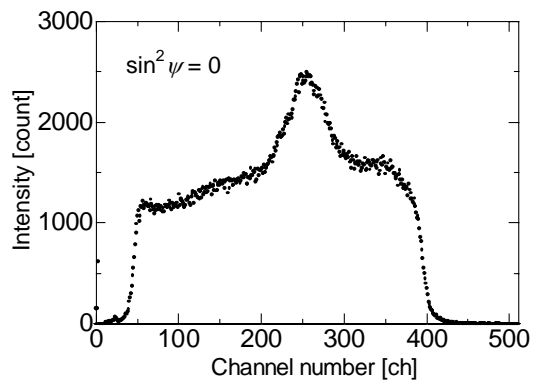
SUS304-3_Mn 溶接線直角方向

母材部 (x=22 mm)

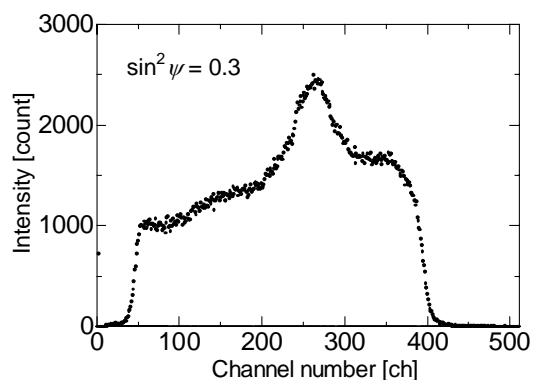
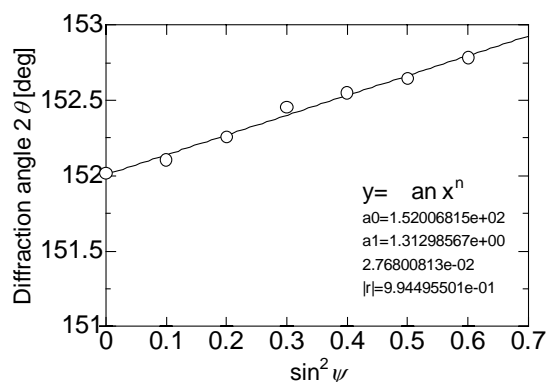
$\sin^2 \psi$ 線図



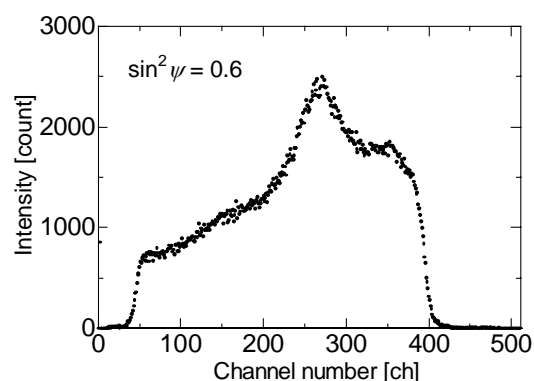
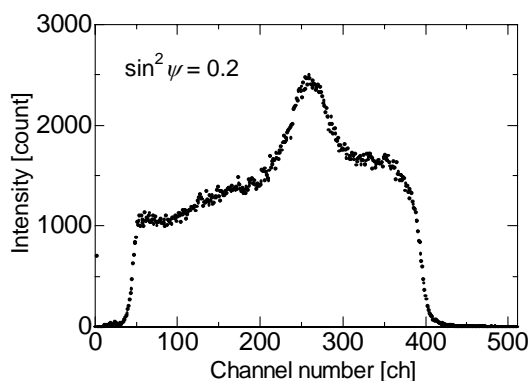
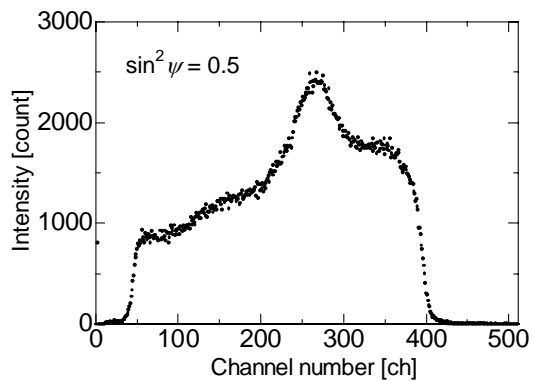
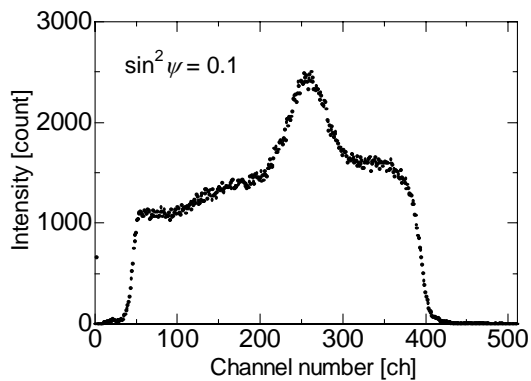
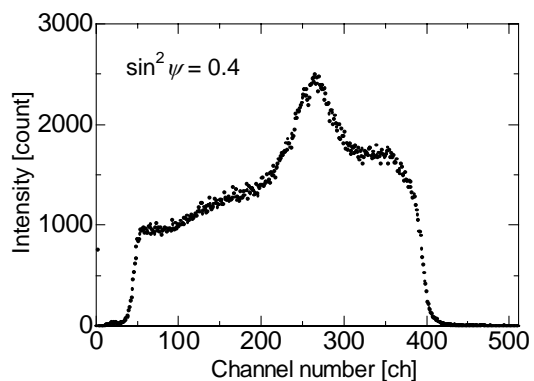
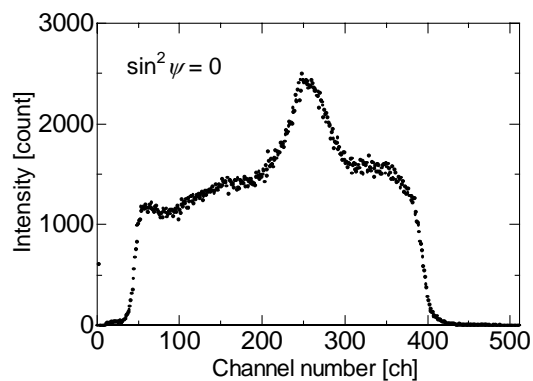
Profile



$\sin^2 \psi$ 線図



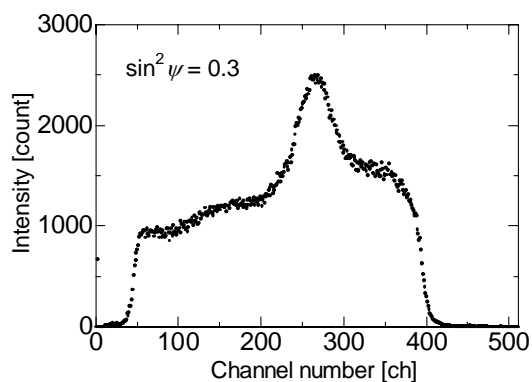
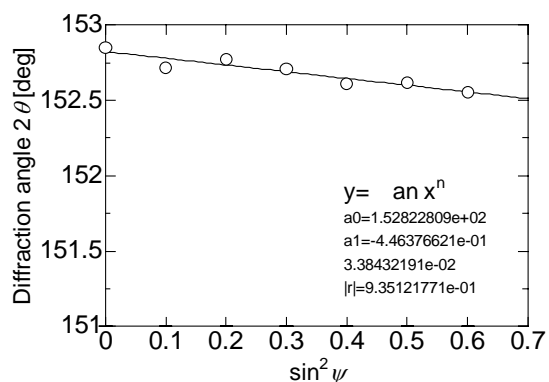
Profile



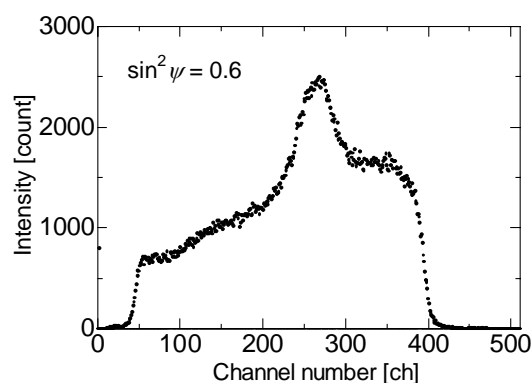
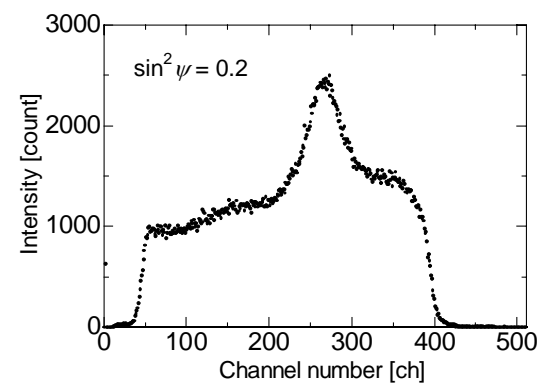
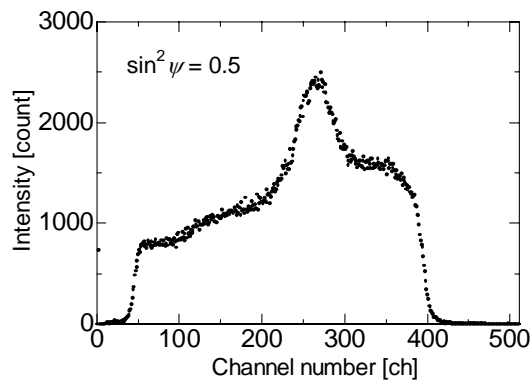
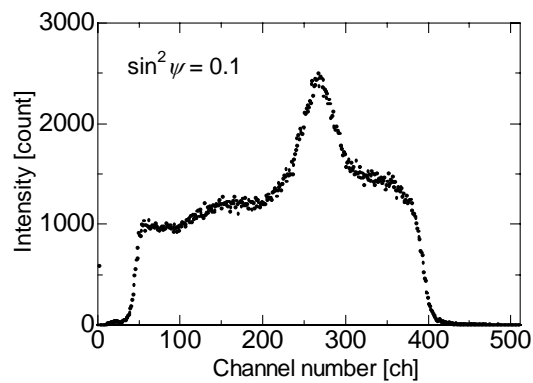
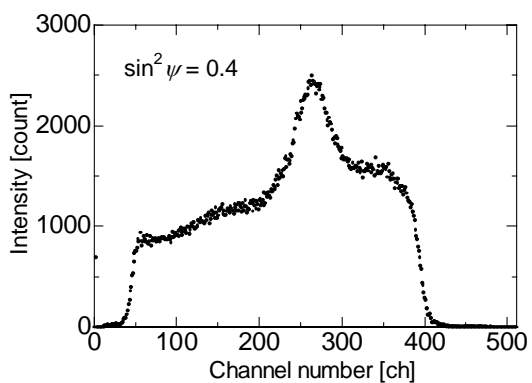
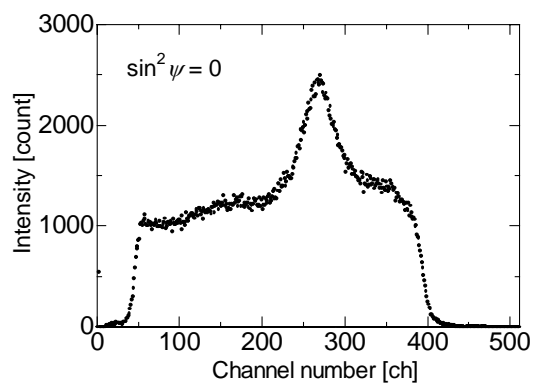
SUS304-3_Mn 溶接線方向

熱影響部 (x=-9 mm)

$\sin^2 \psi$ 線圖



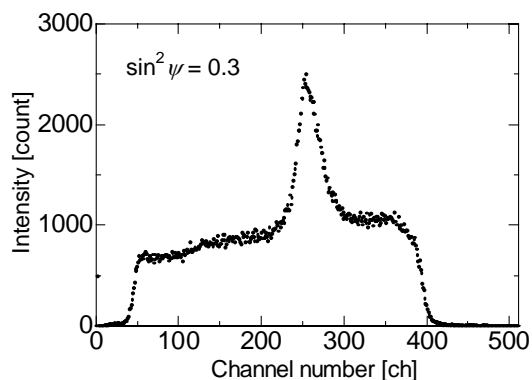
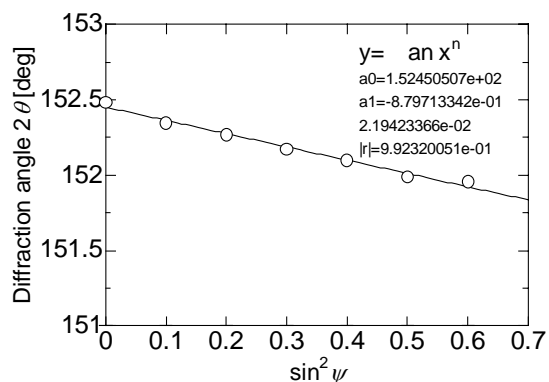
Profile



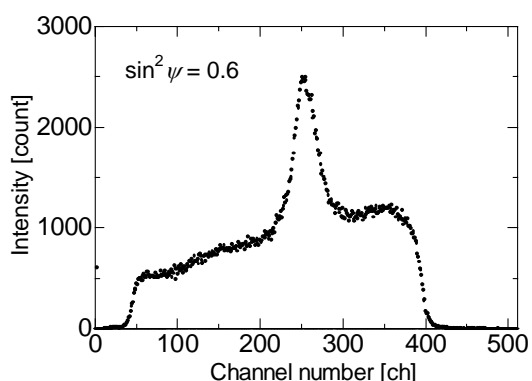
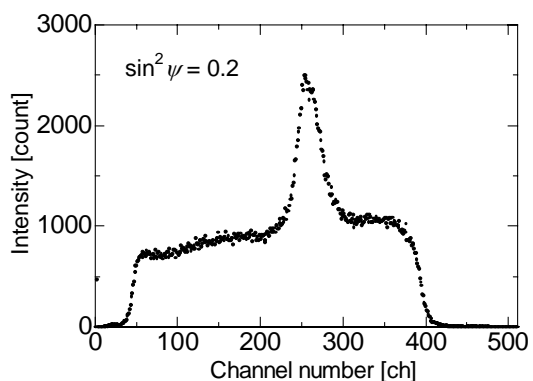
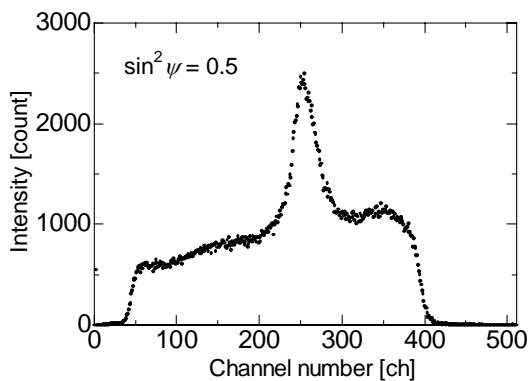
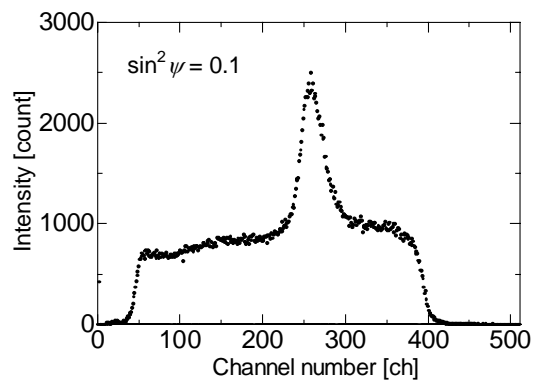
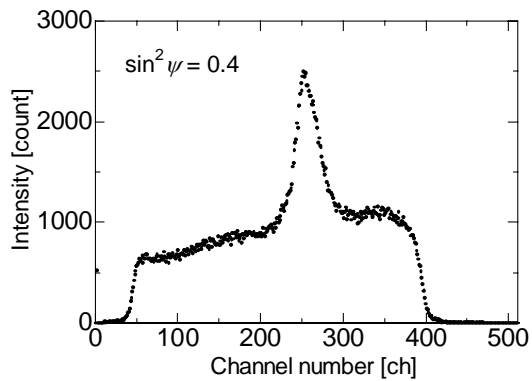
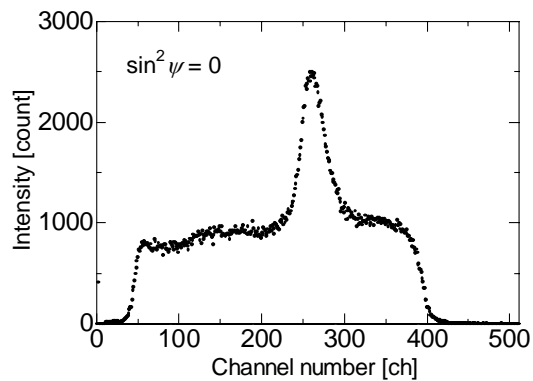
SUS304-3_Mn 溶接線方向

止端部 (x=-6 mm)

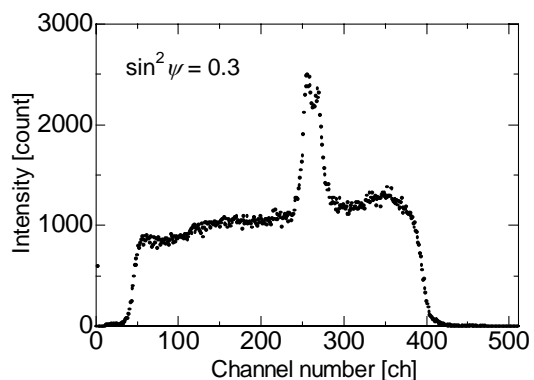
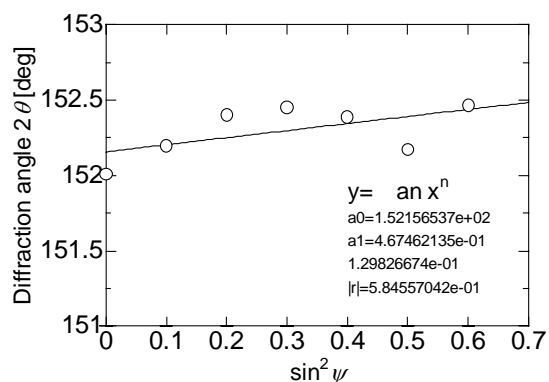
$\sin^2 \psi$ 線図



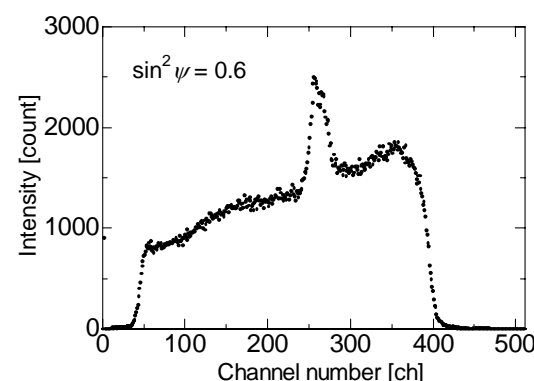
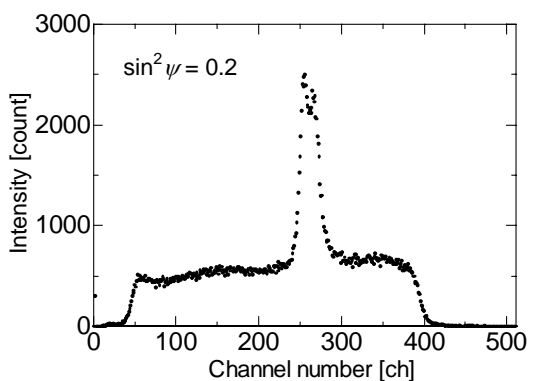
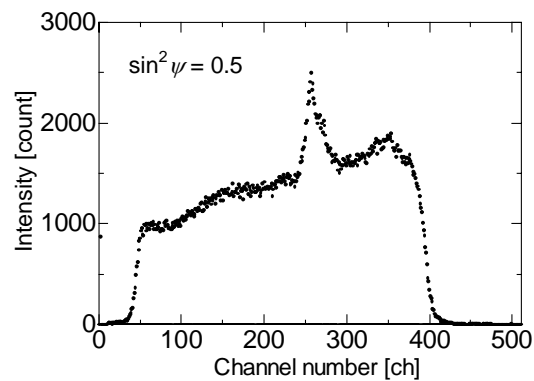
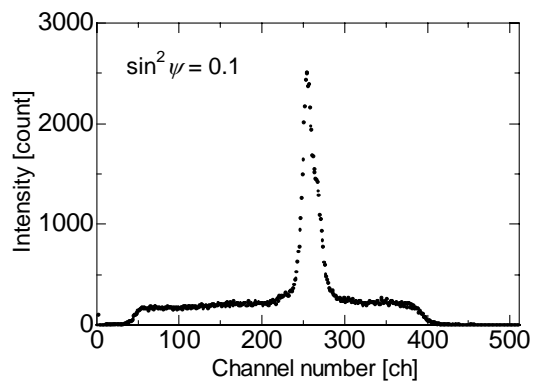
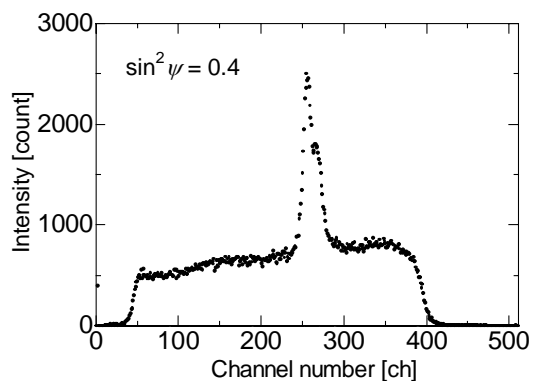
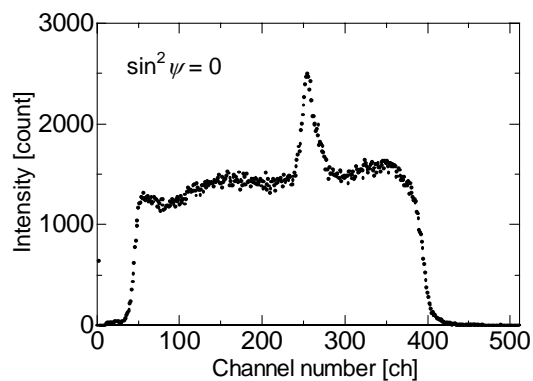
Profile



$\sin^2 \psi$ 線図



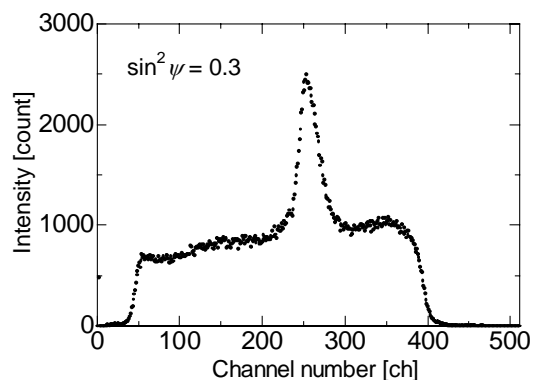
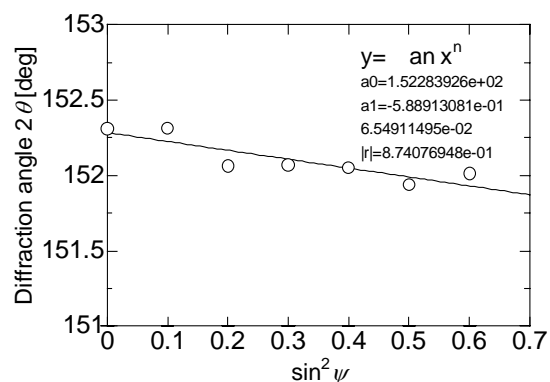
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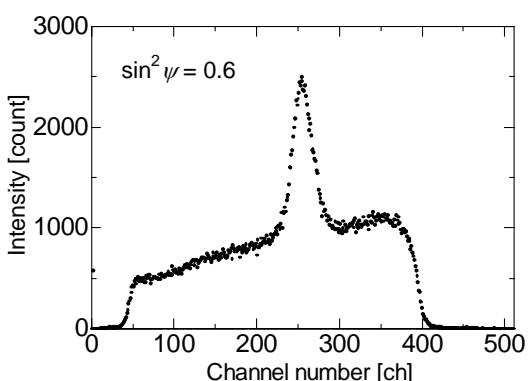
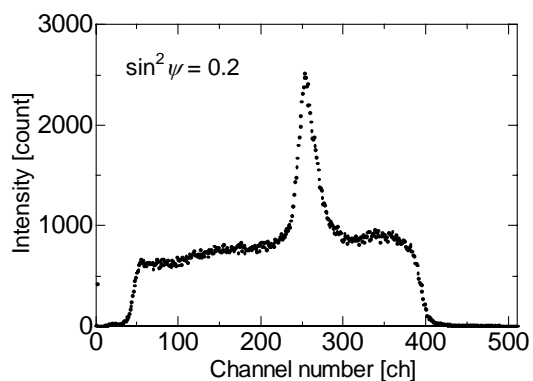
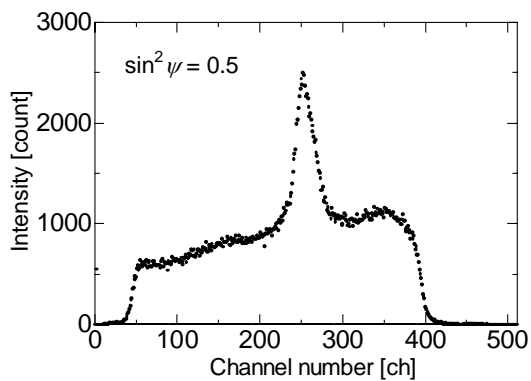
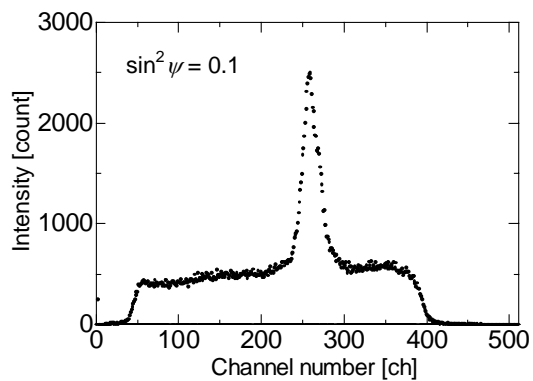
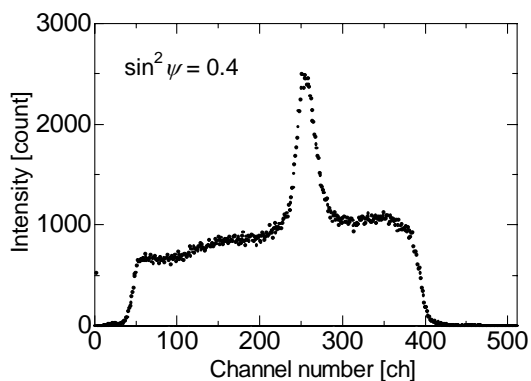
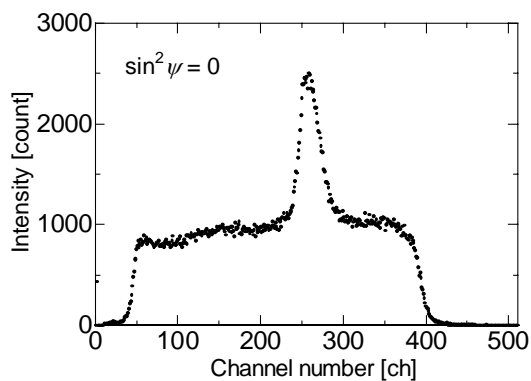
SUS304-3_Mn 溶接線方向

止端部 (x=6 mm)

$\sin^2 \psi$ 線図



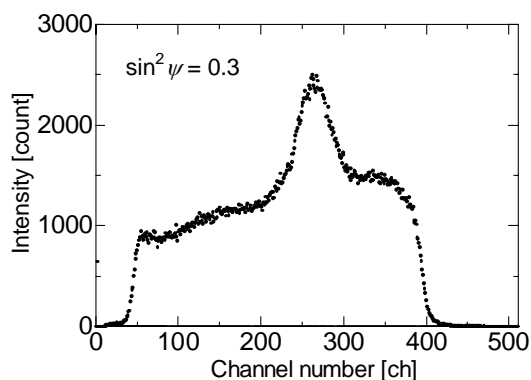
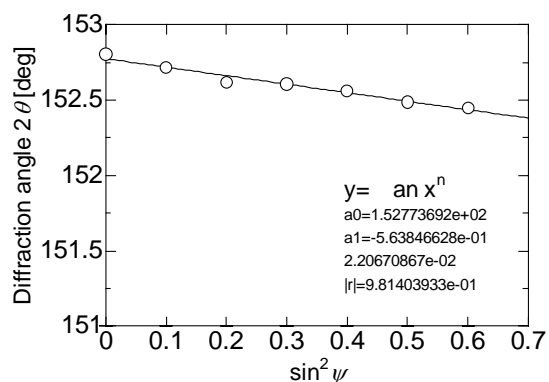
Profile



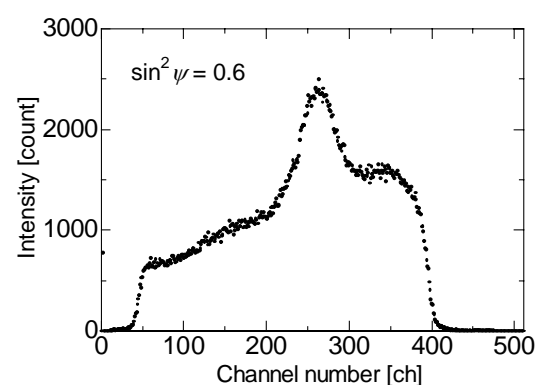
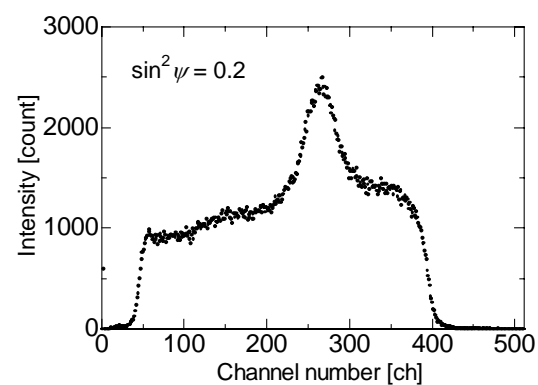
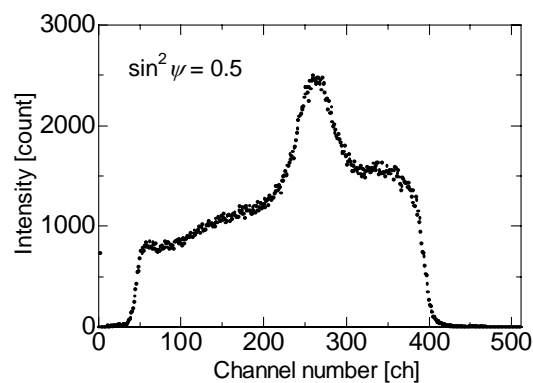
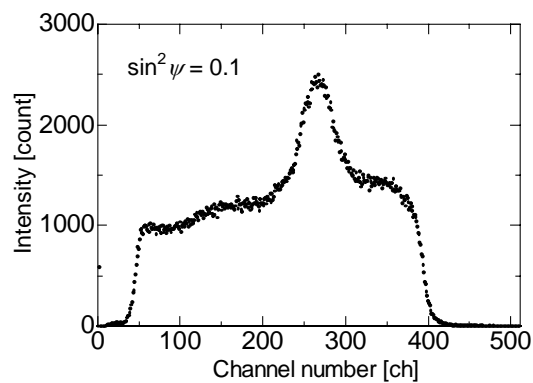
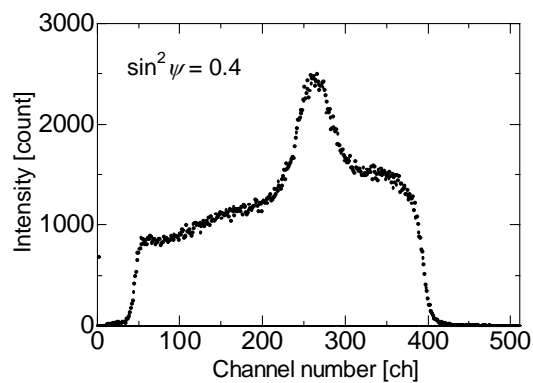
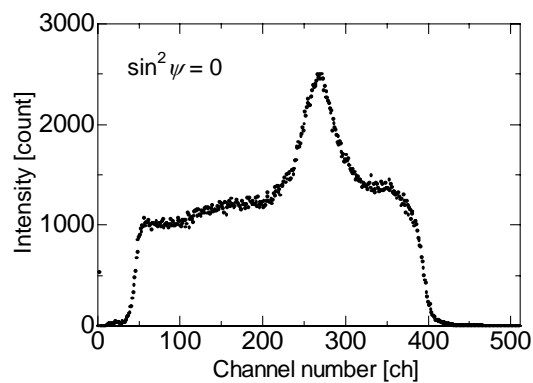
SUS304-3_Mn 溶接線方向

熱影響部 (x=9 mm)

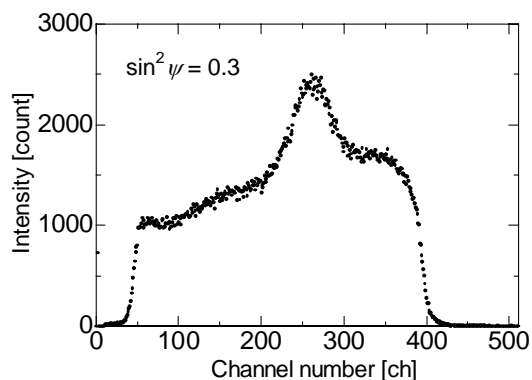
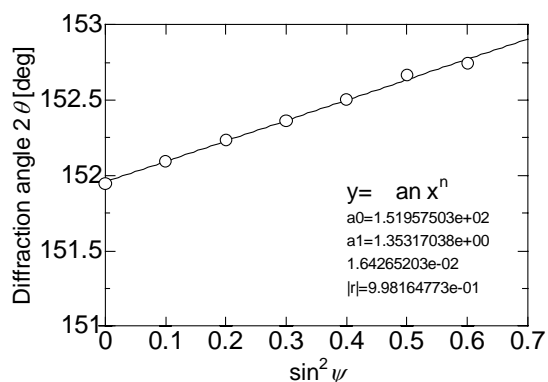
$\sin^2 \psi$ 線圖



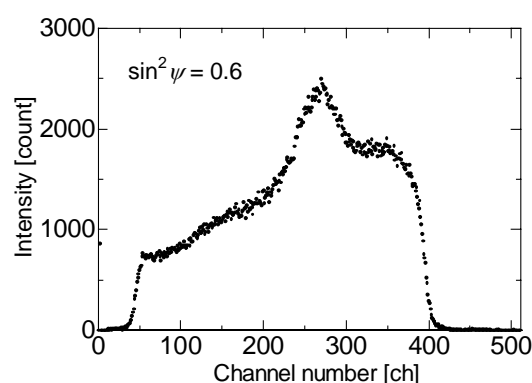
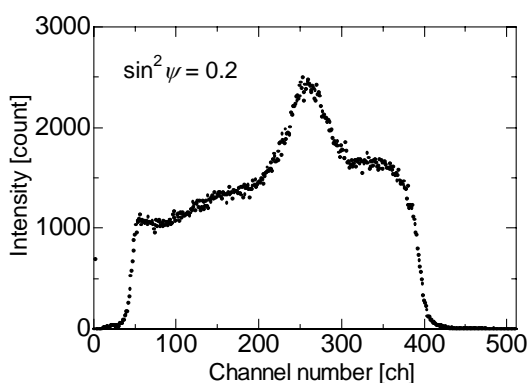
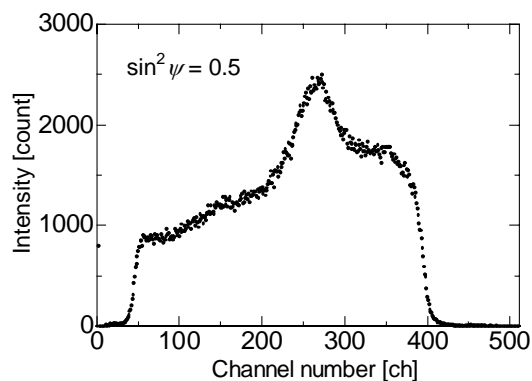
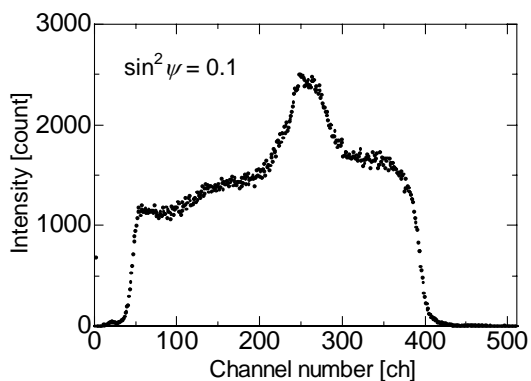
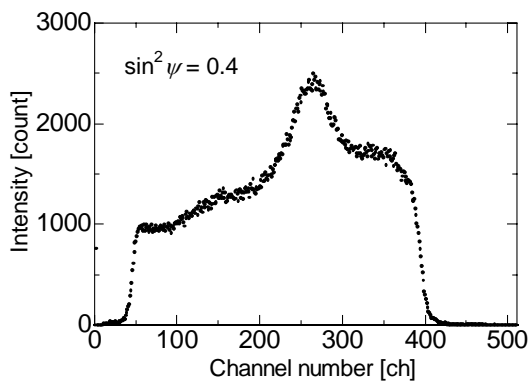
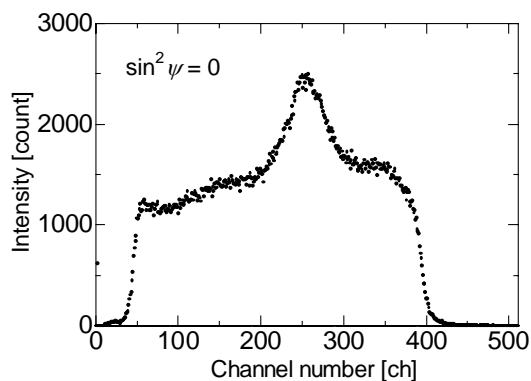
Profile



$\sin^2 \psi$ 線図



Profile

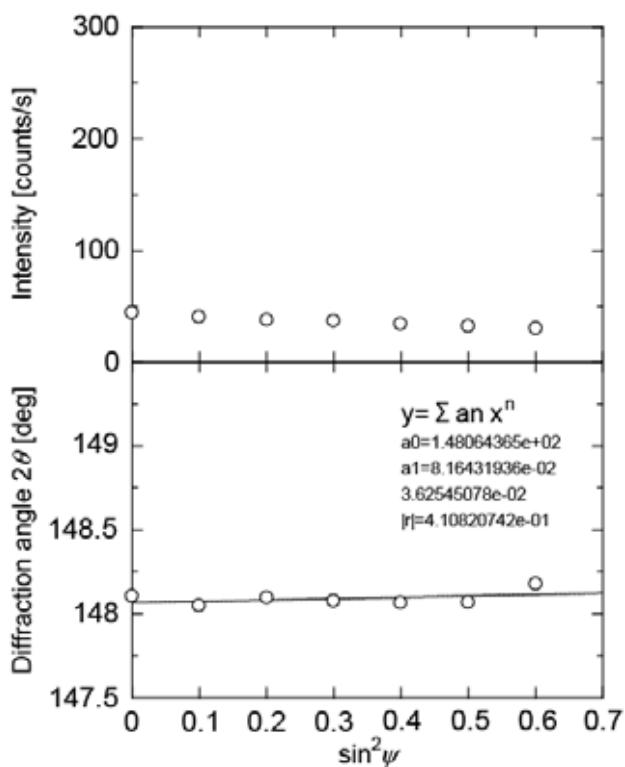


SUS304-3(Cr) 生データ

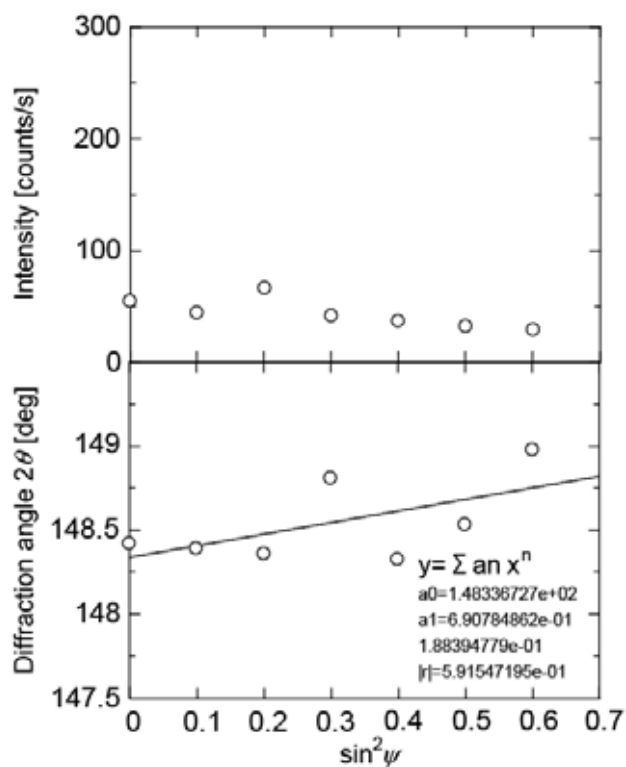
SUS304-3_Cr 溶接線直角方向

Intensity

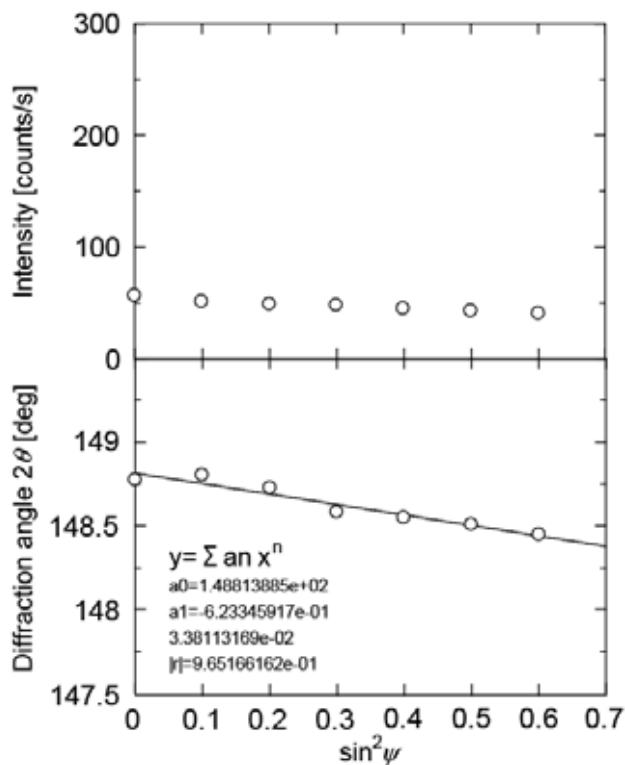
母材部 (x=-21.5[mm])



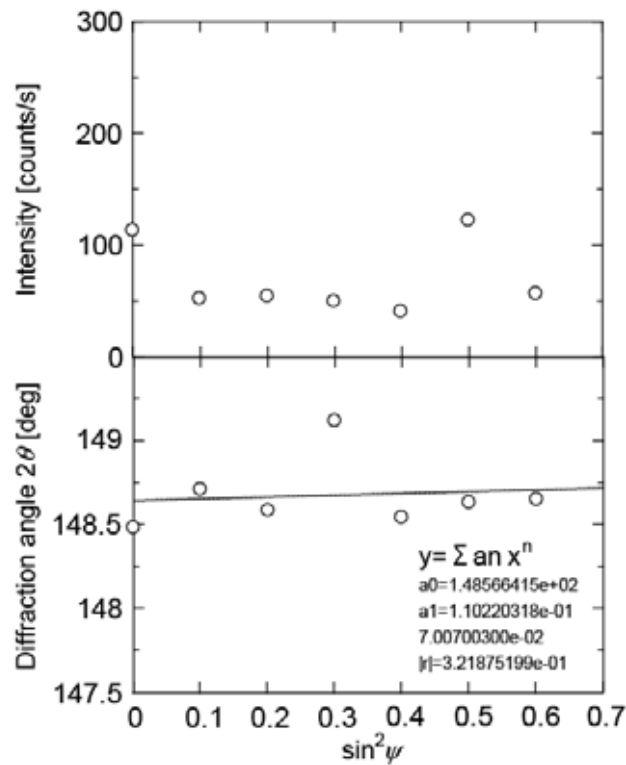
止端部付近 (x=-3.5[mm])



熱影響部 (x=-7[mm])

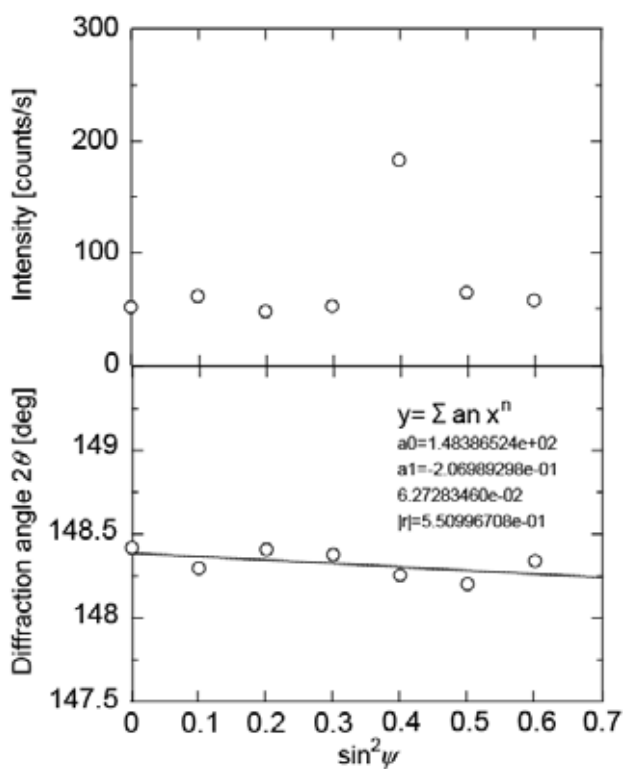


ビード部 (x=0[mm])

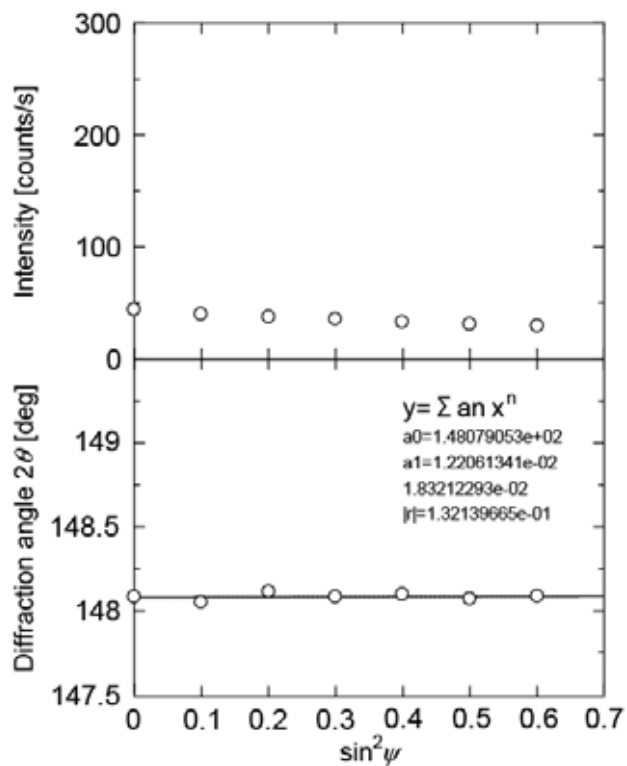


SUS304-3_Cr 溶接線直角方向

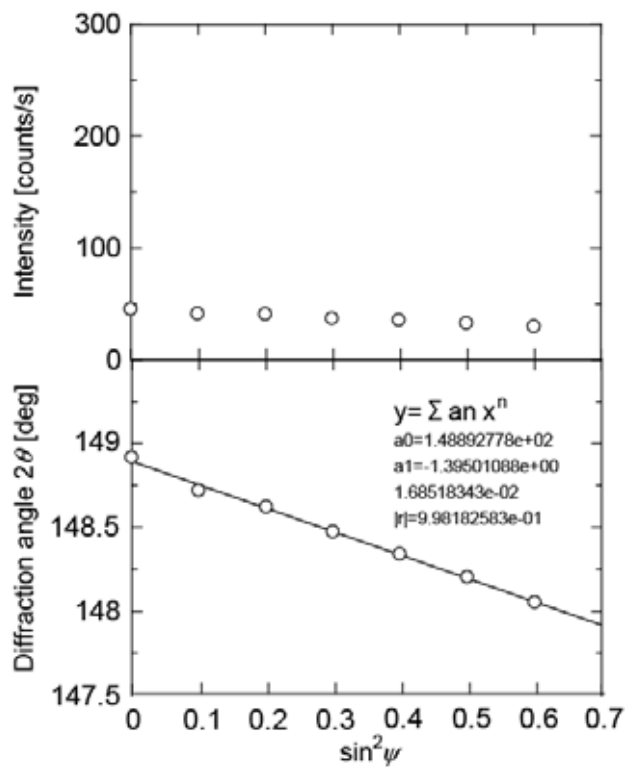
止端部付近 (x=3.5[mm])



母材部 (x=21.5[mm])



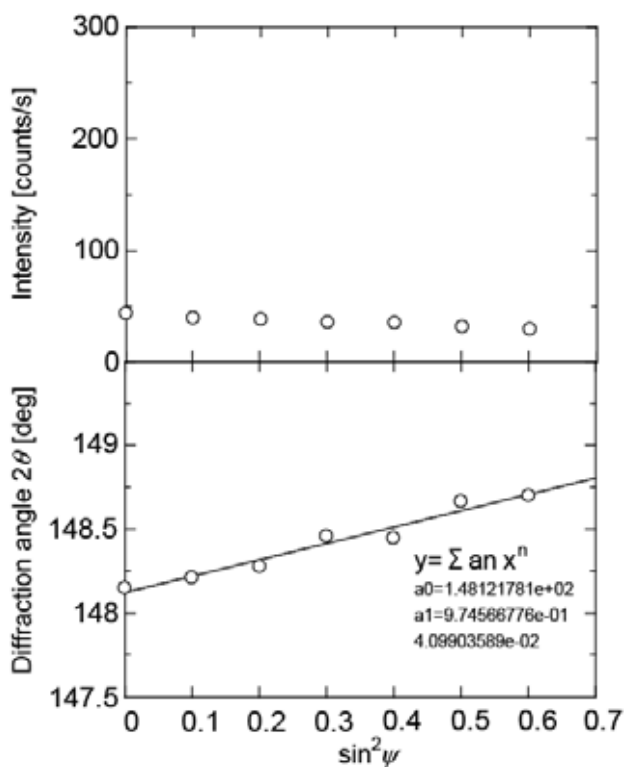
熱影響部 (x=7[mm])



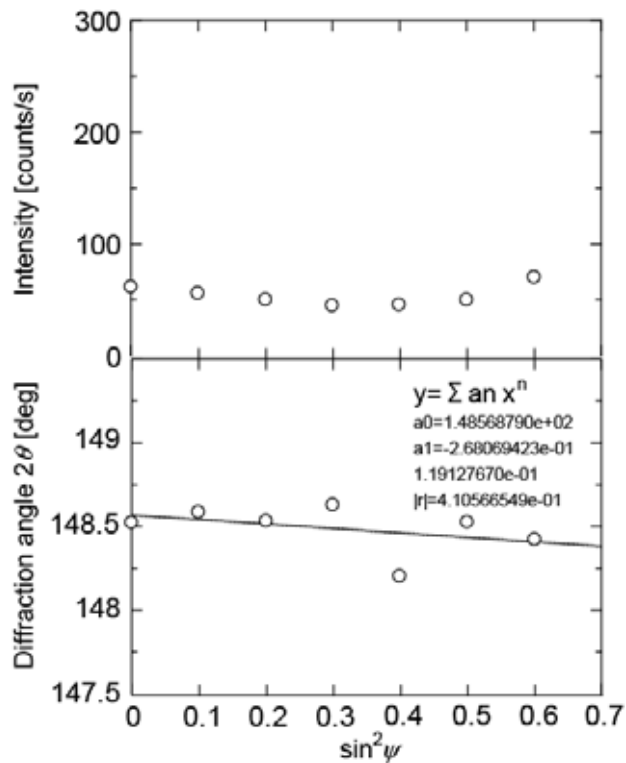
SUS304-3_Cr 溶接線方向

Intensity

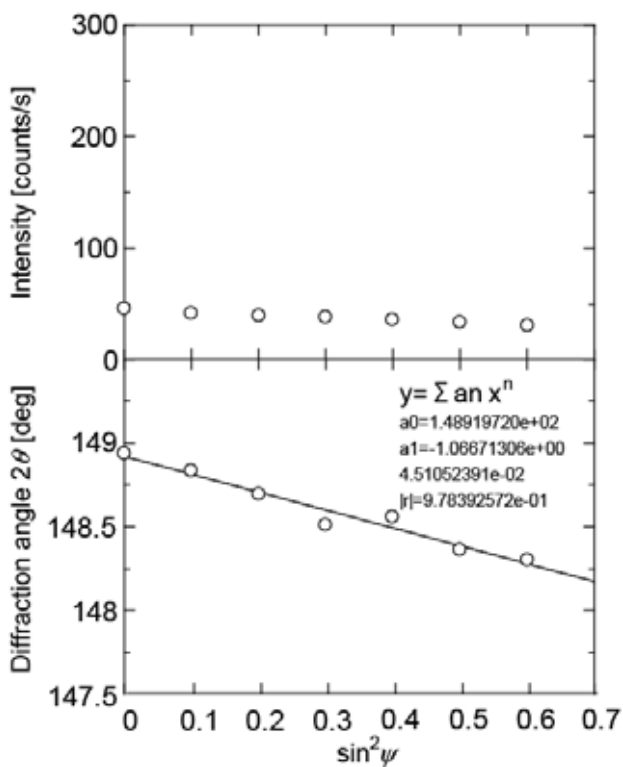
母材部 (x=-21.5[mm])



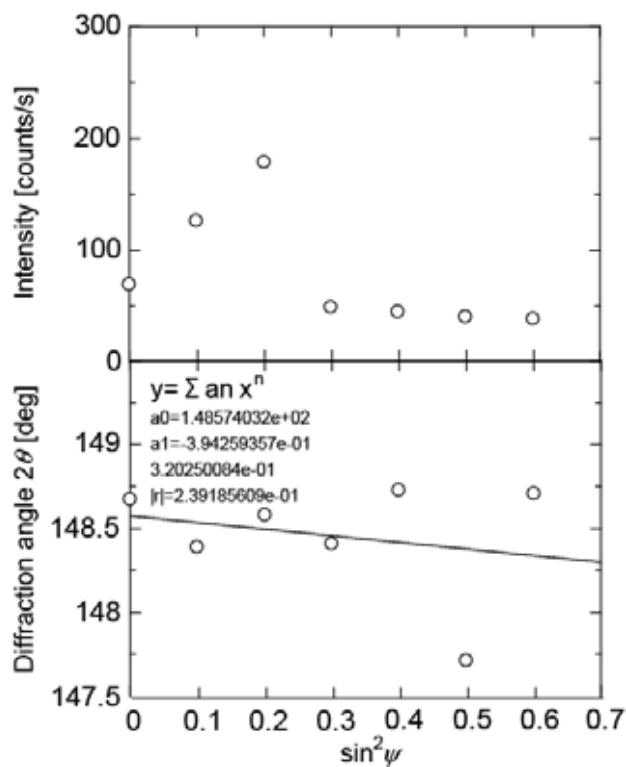
止端部付近 (x=-3.5[mm])



熱影響部 (x=-7[mm])

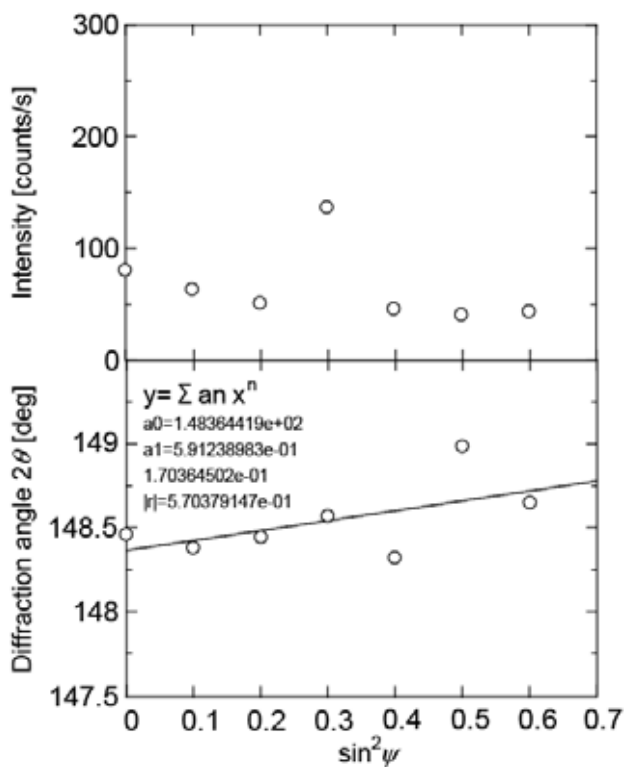


ビード部 (x=0[mm])

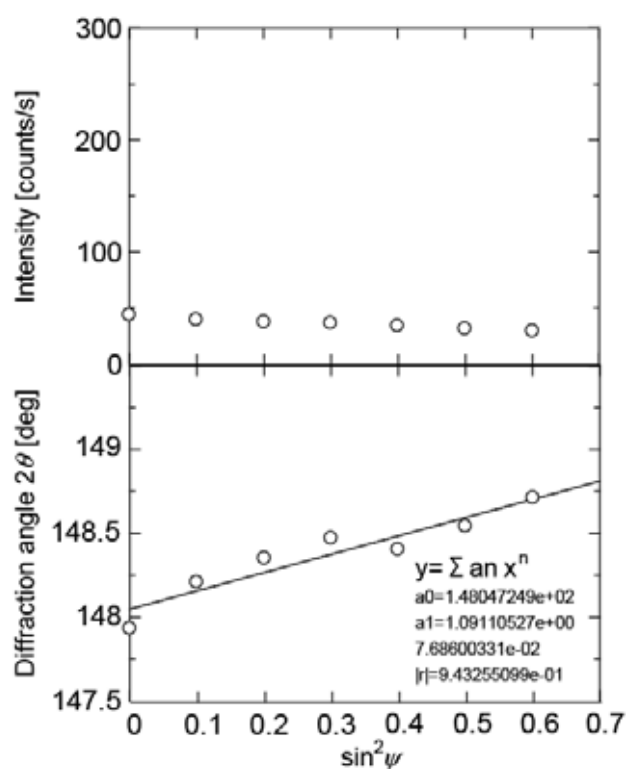


SUS304-3_Cr 溶接線方向

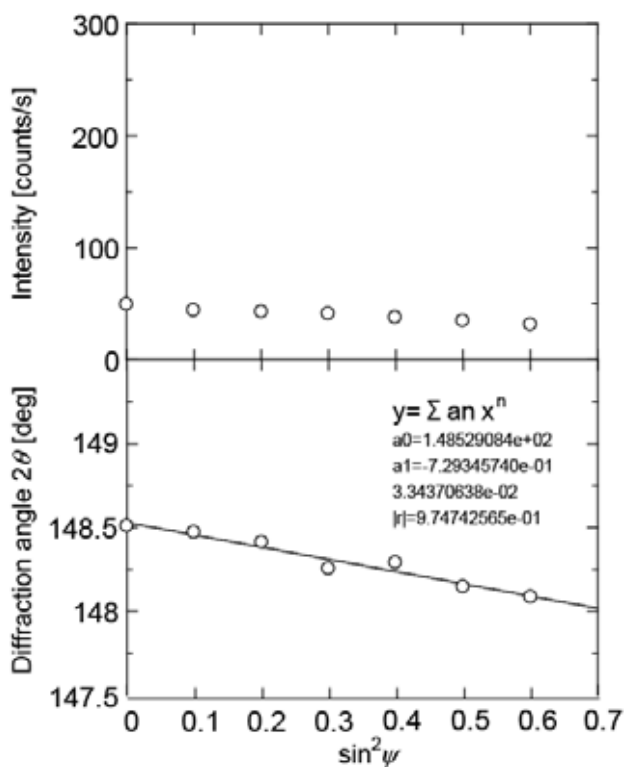
止端部付近 (x=3.5[mm])



母材部 (x=21.5[mm])

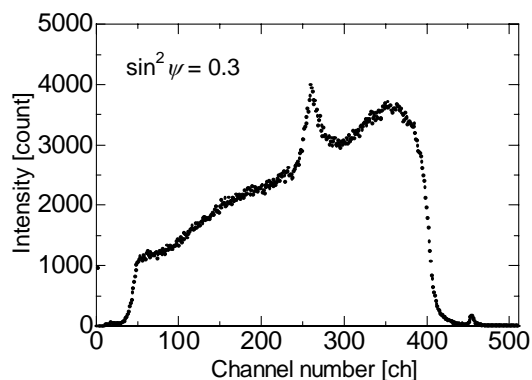
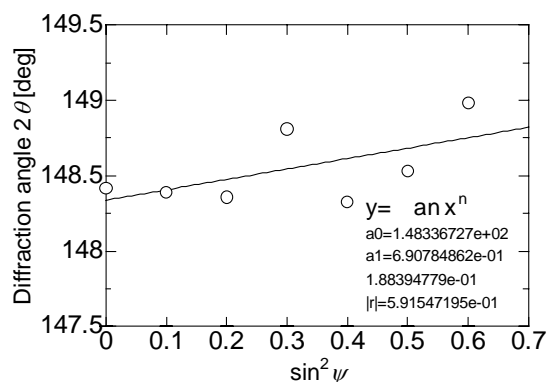


熱影響部 (x=7[mm])

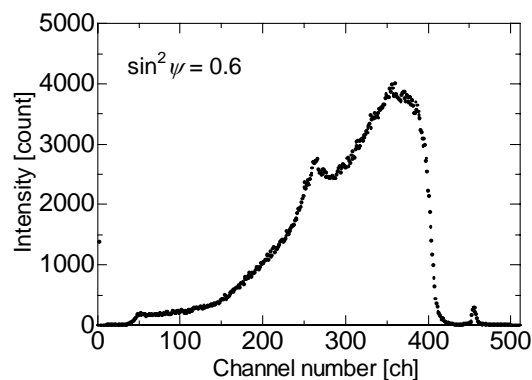
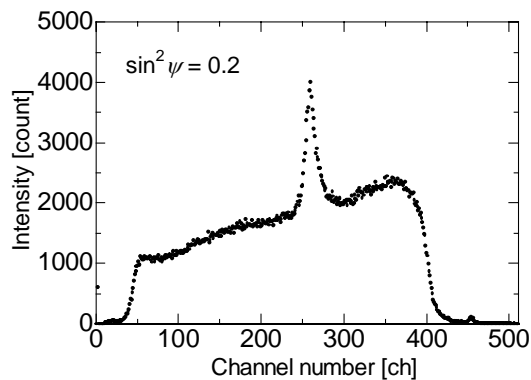
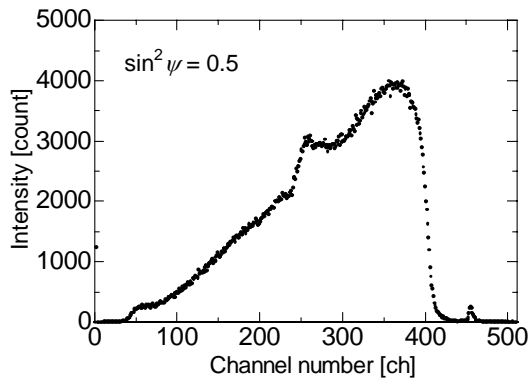
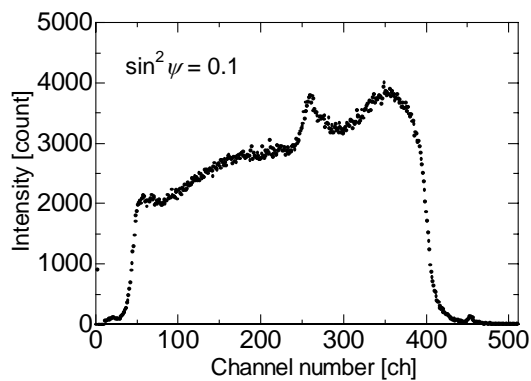
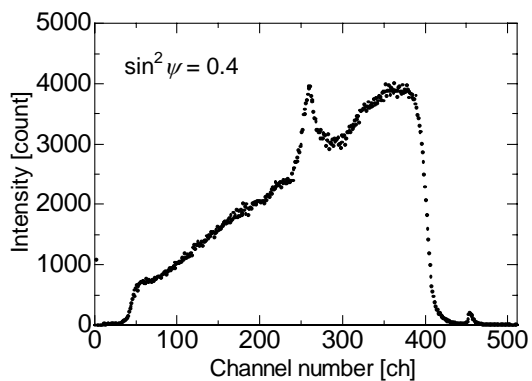
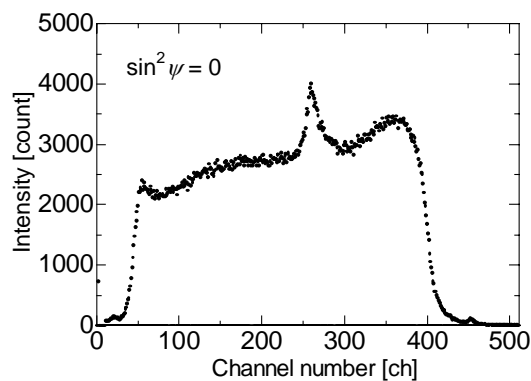


SUS304-3_Cr 溶接線直角方向
止端部付近 (x=-3.5 mm)

$\sin^2 \psi$ 線図



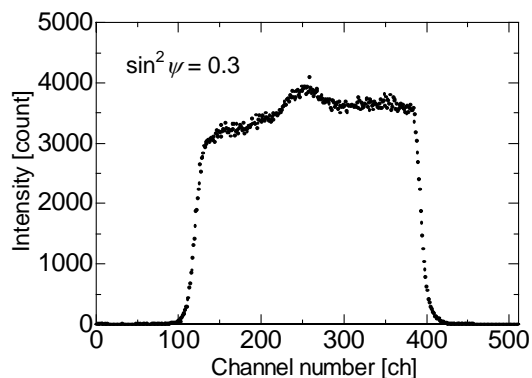
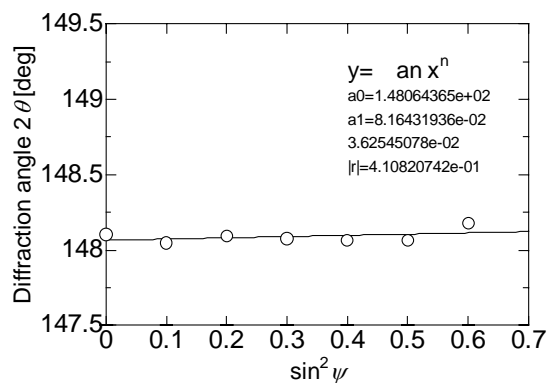
Profile



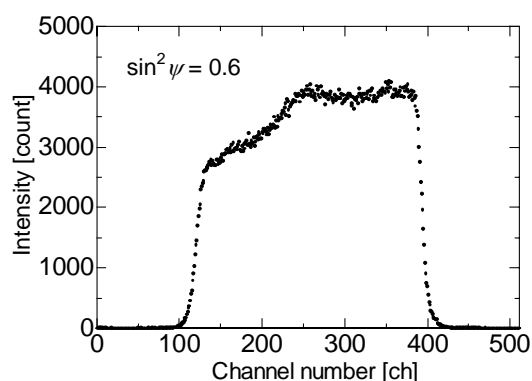
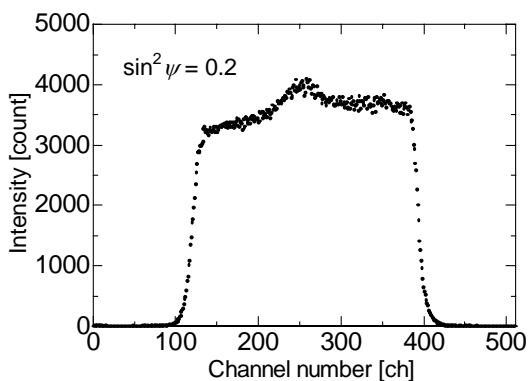
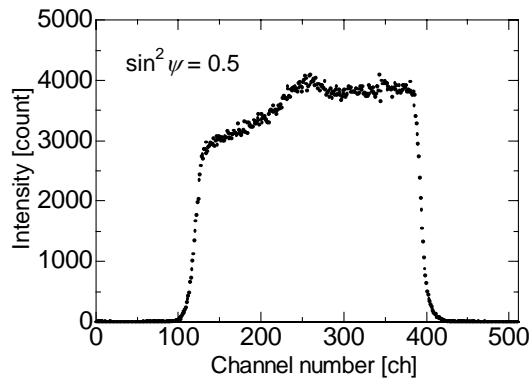
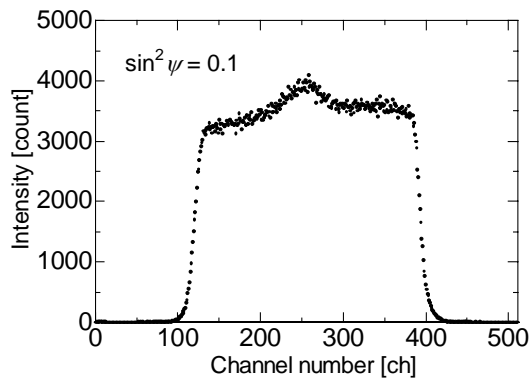
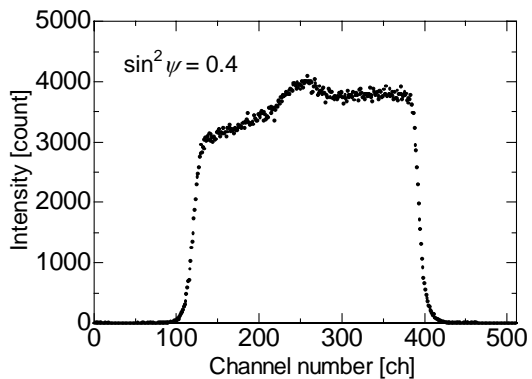
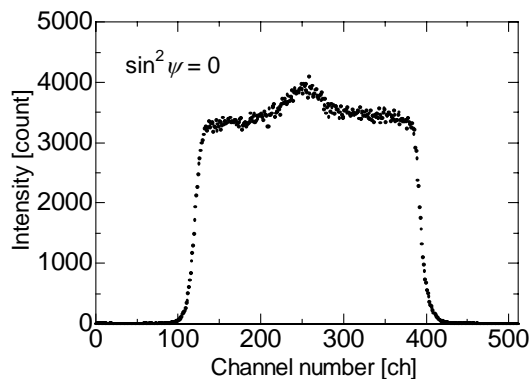
SUS304-3_Cr 溶接線直角方向

母材部 (x=-21.5 mm)

$\sin^2 \psi$ 線図



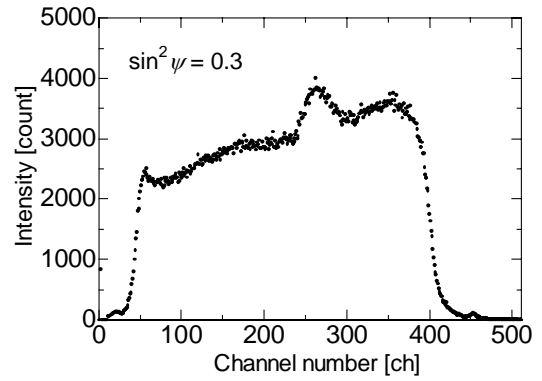
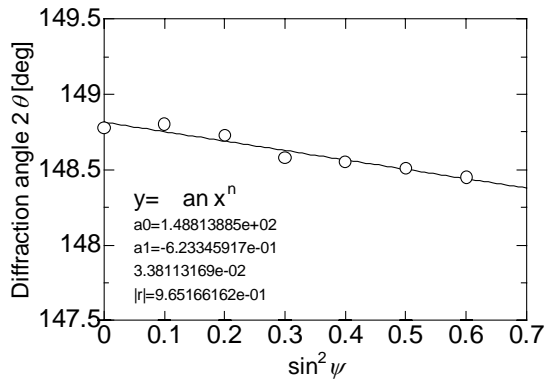
Profile



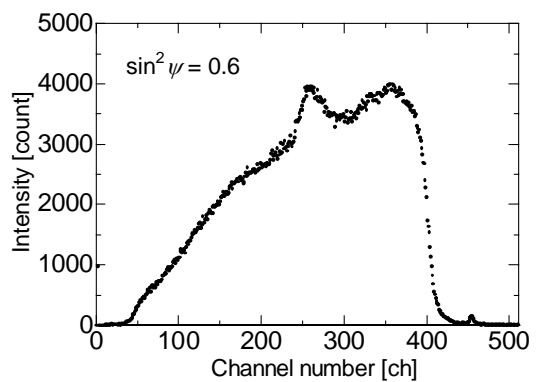
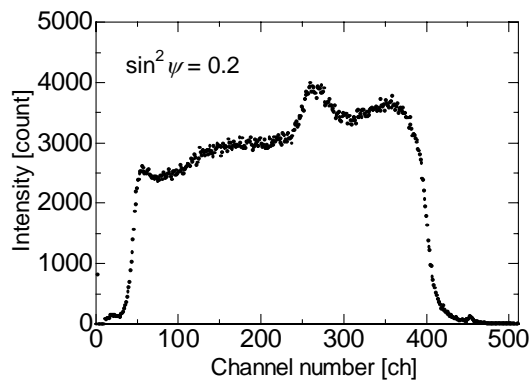
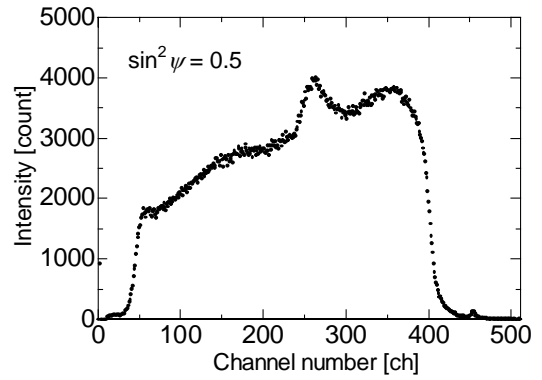
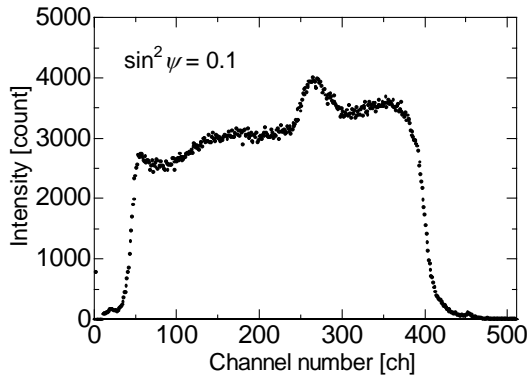
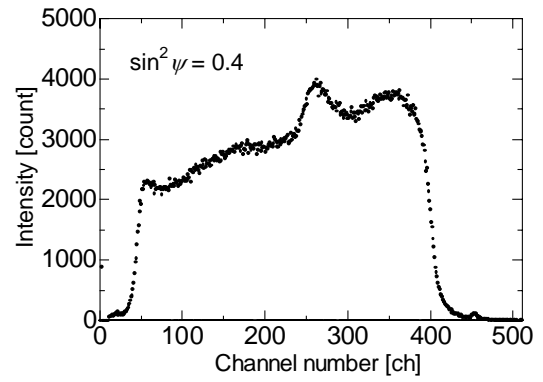
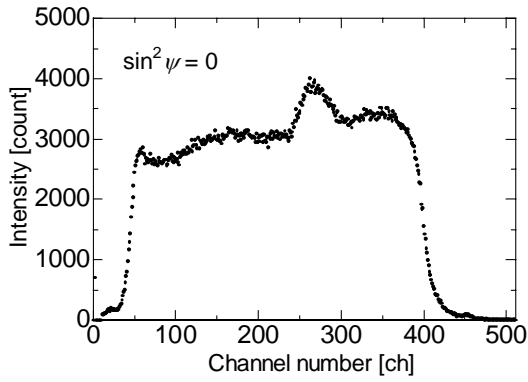
SUS304-3_Cr 溶接線直角方向

熱影響部 (x=-7 mm)

$\sin^2 \psi$ 線圖



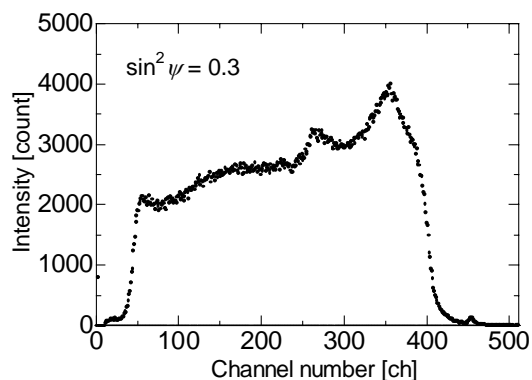
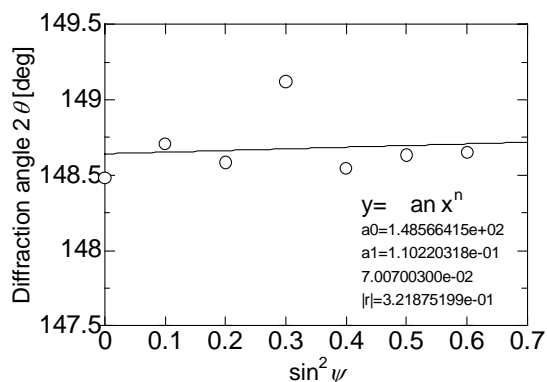
Profile



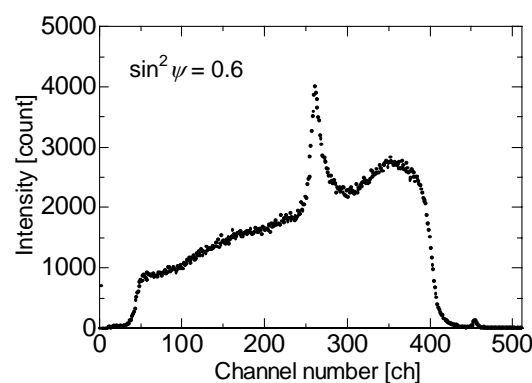
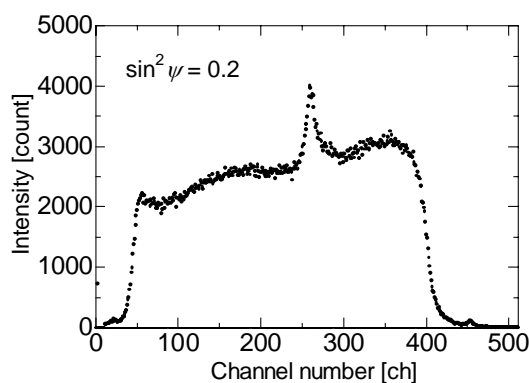
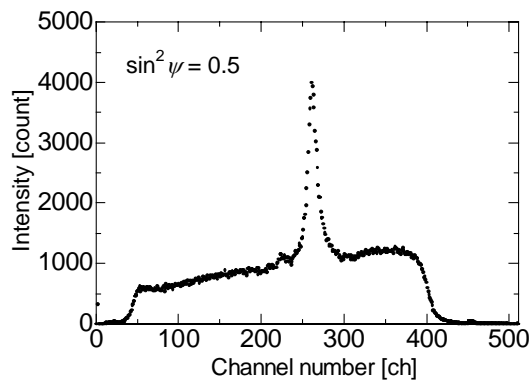
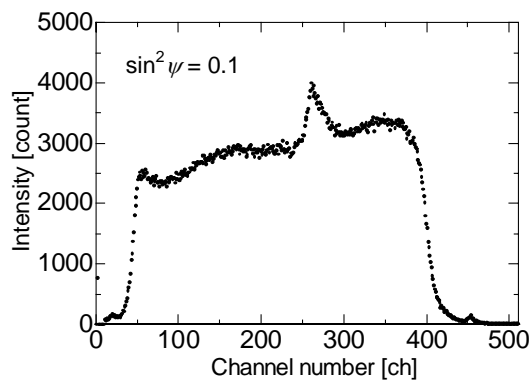
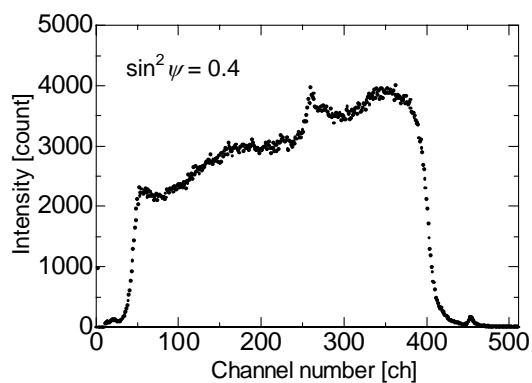
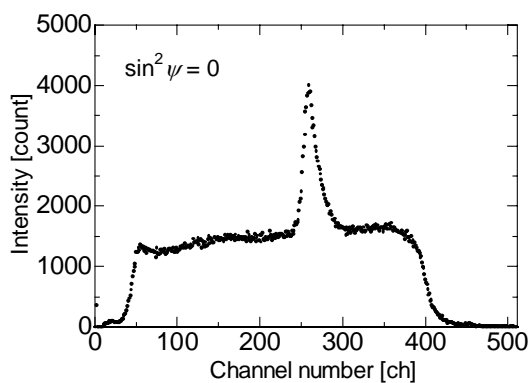
SUS304-3_Cr 溶接線直角方向

ヒード部 (x=0 mm)

$\sin^2 \psi$ 線図



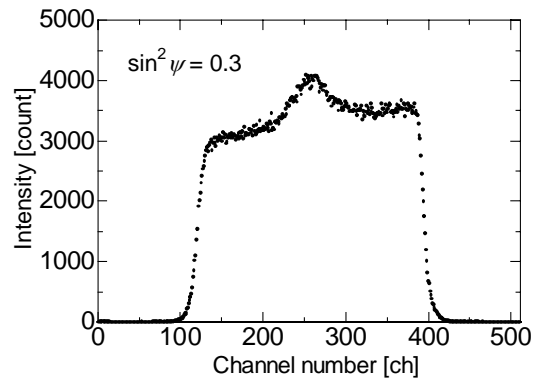
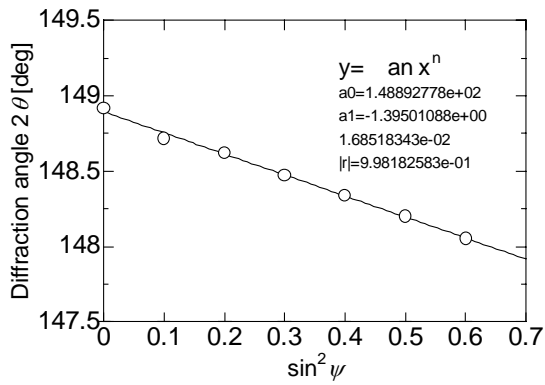
Profile



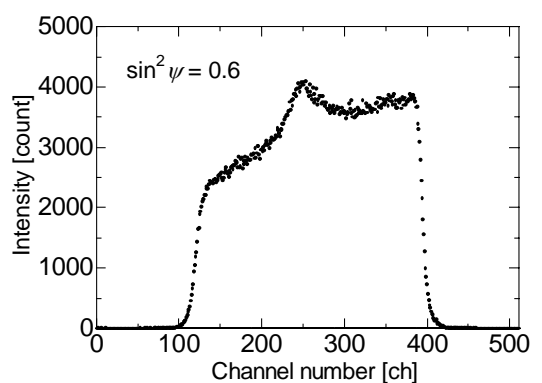
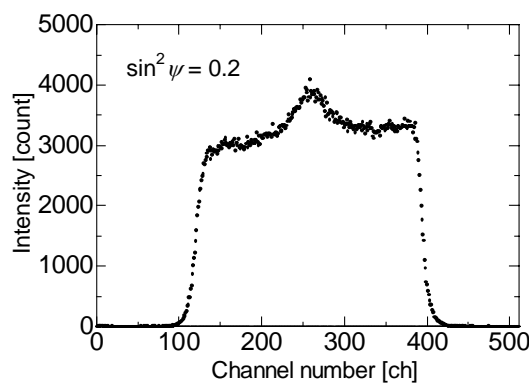
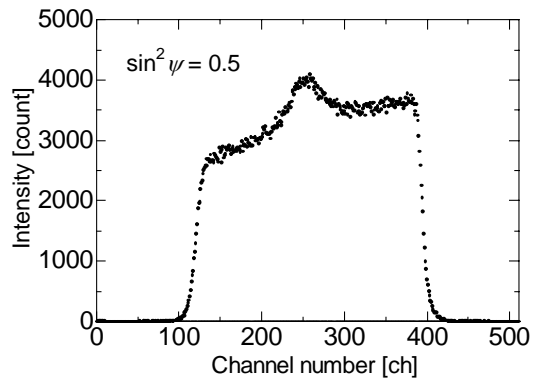
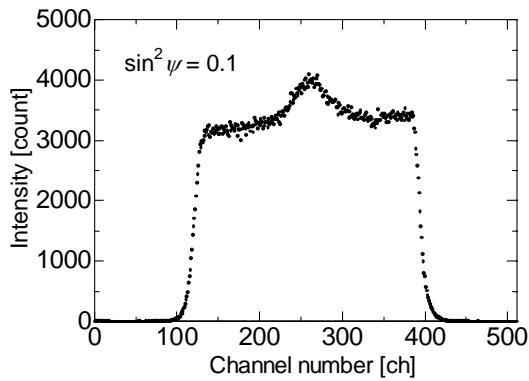
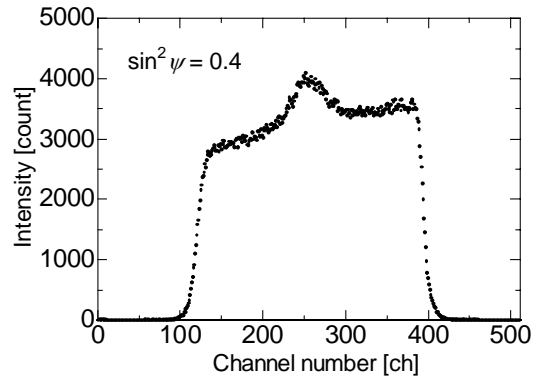
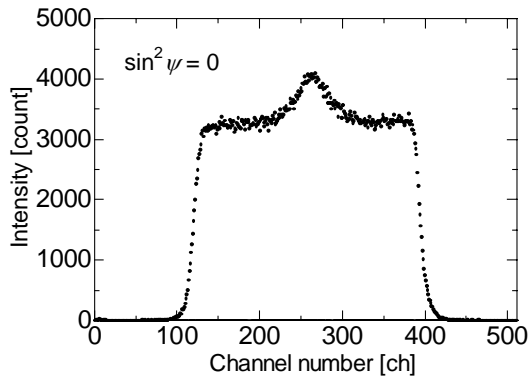
SUS304-3_Cr 溶接線直角方向

熱影響部 (x=7 mm)

$\sin^2 \psi$ 線圖



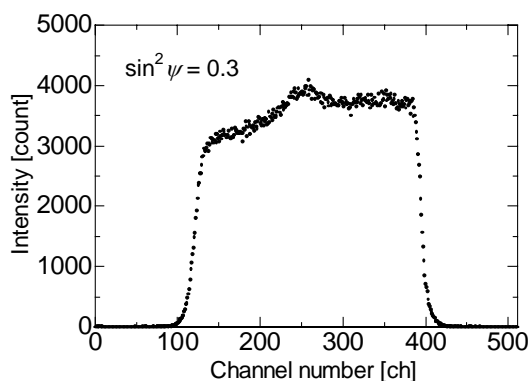
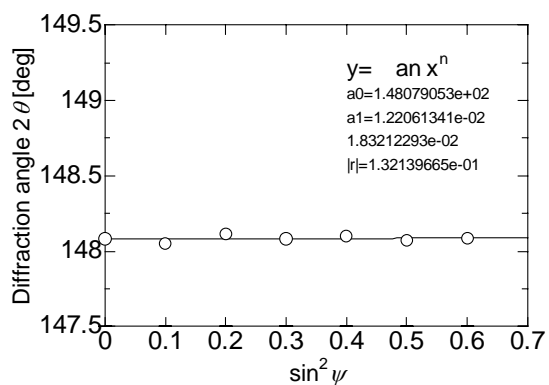
Profile



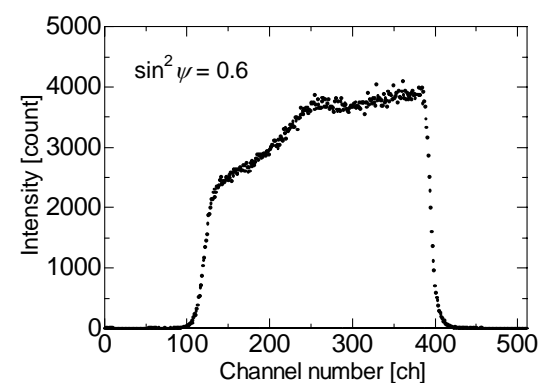
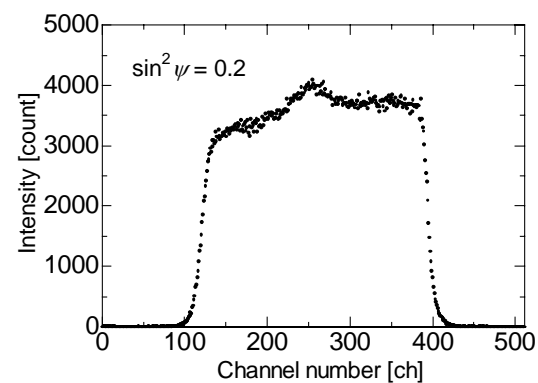
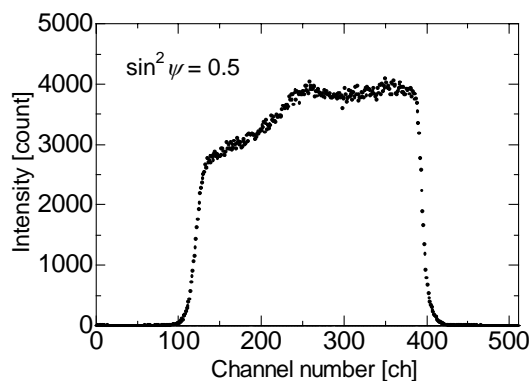
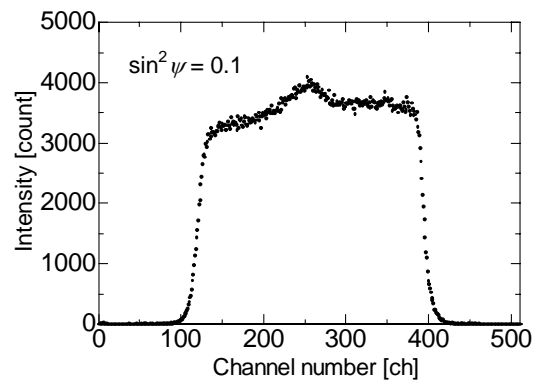
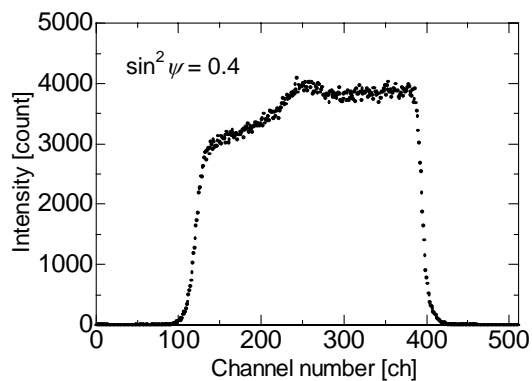
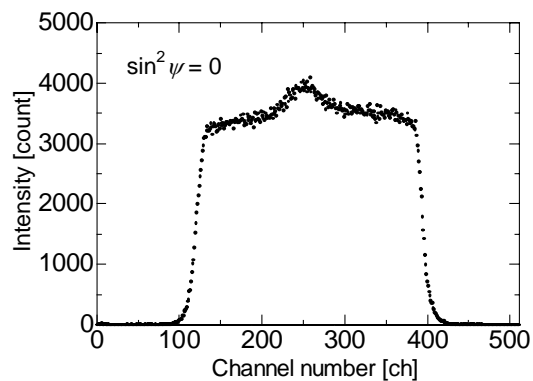
SUS304-3_Cr 溶接線直角方向

母材部 (x=21.5 mm)

$\sin^2 \psi$ 線圖

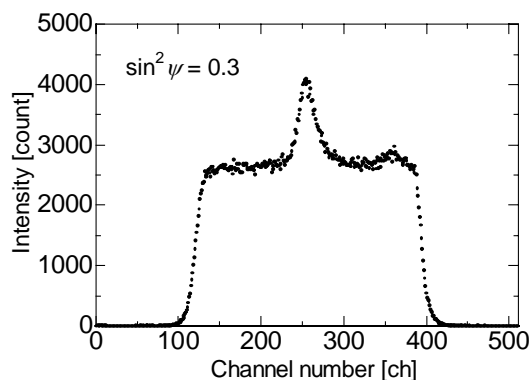
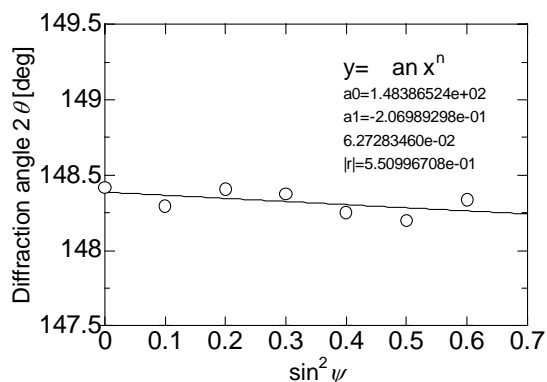


Profile

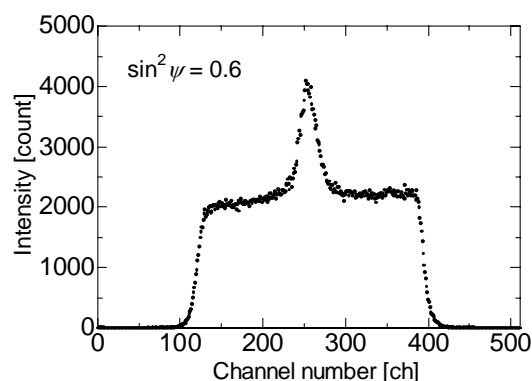
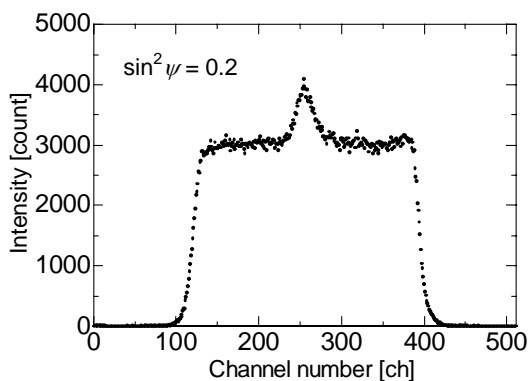
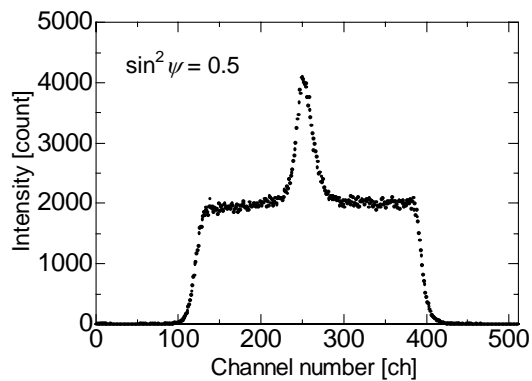
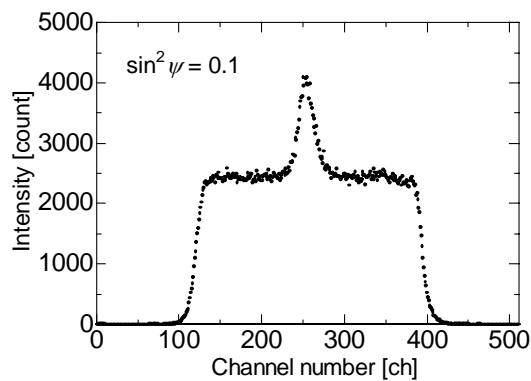
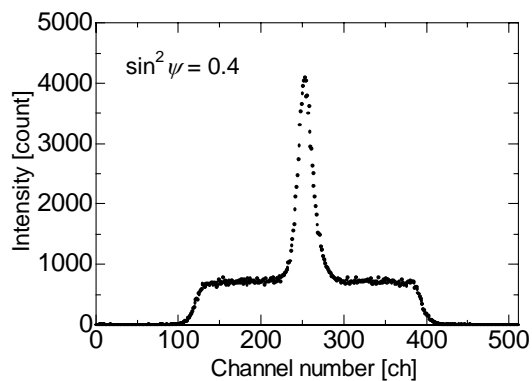
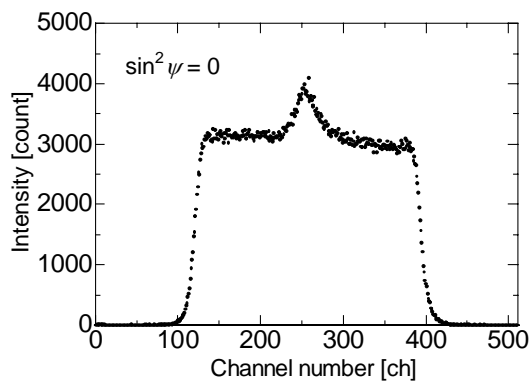


SUS304-3_Cr 溶接線直角方向
止端部付近 (x=3.5 mm)

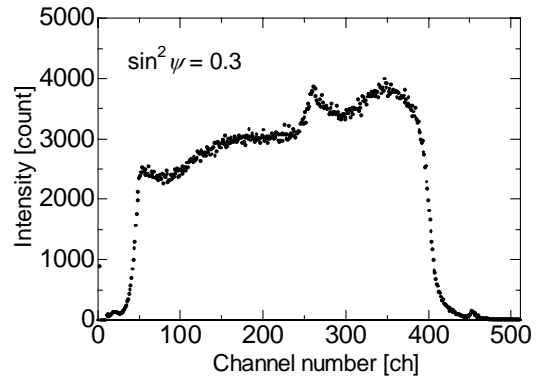
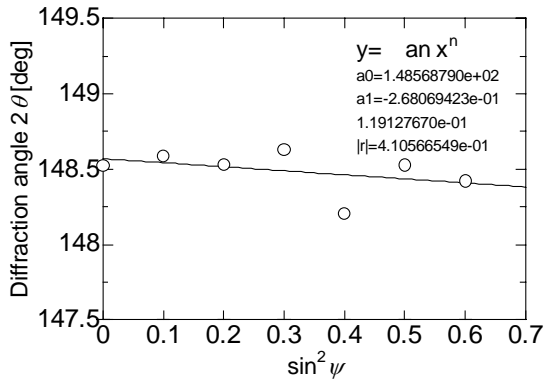
$\sin^2 \psi$ 線図



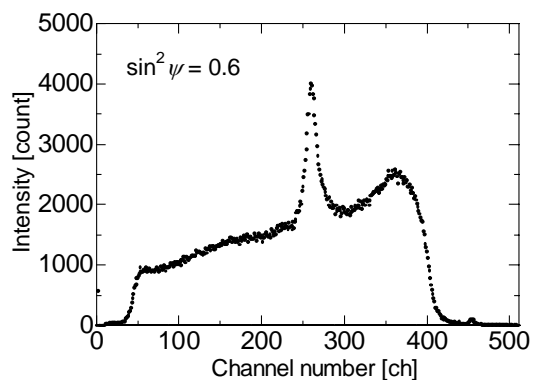
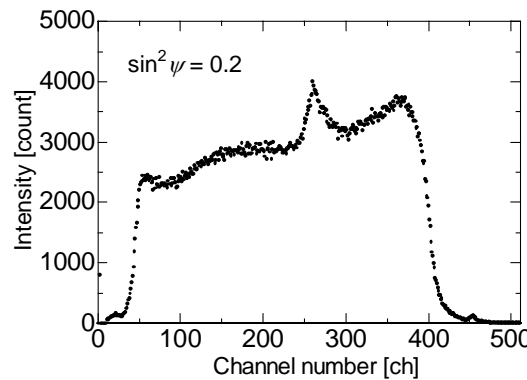
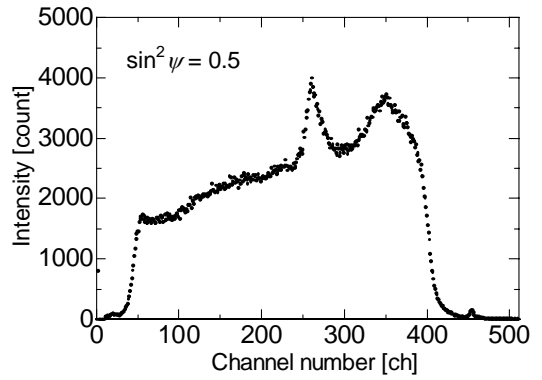
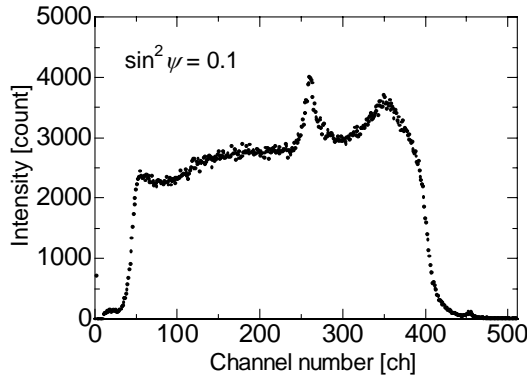
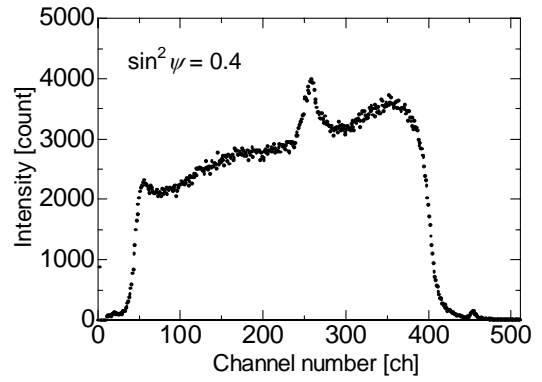
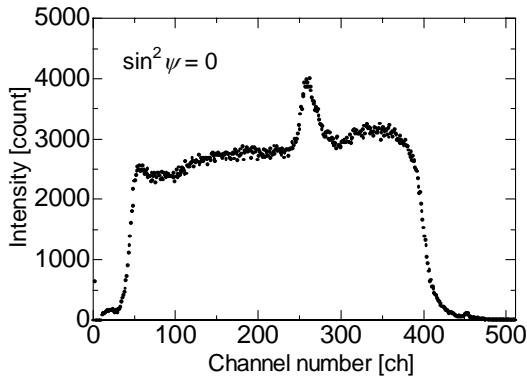
Profile



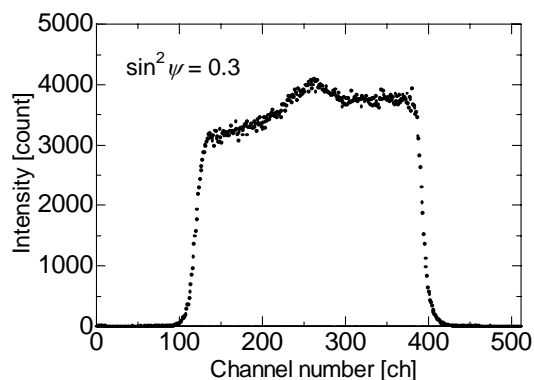
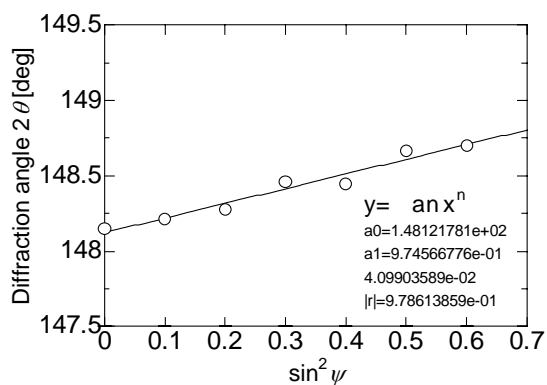
$\sin^2 \psi$ 線図



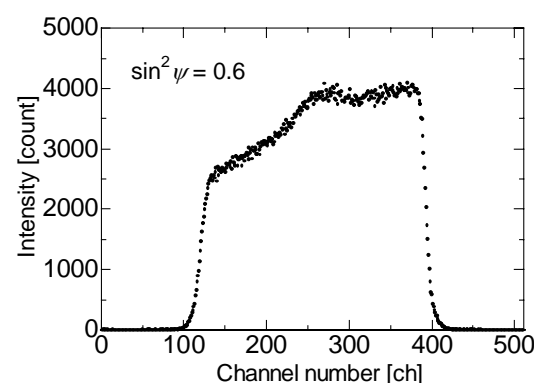
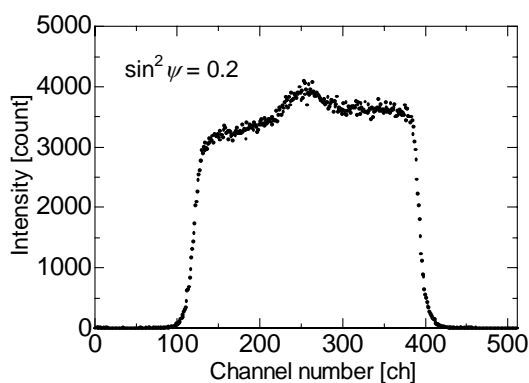
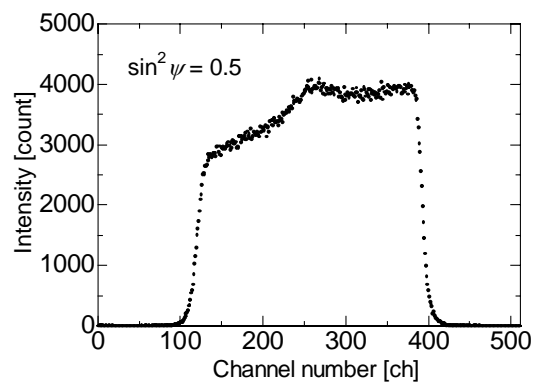
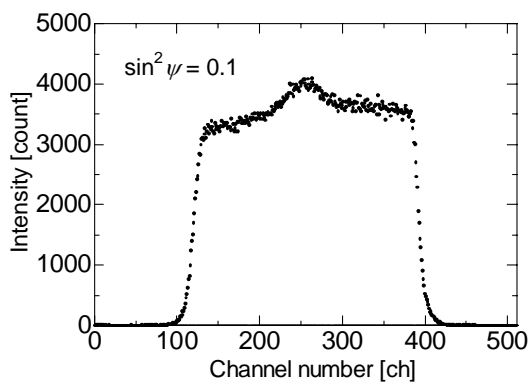
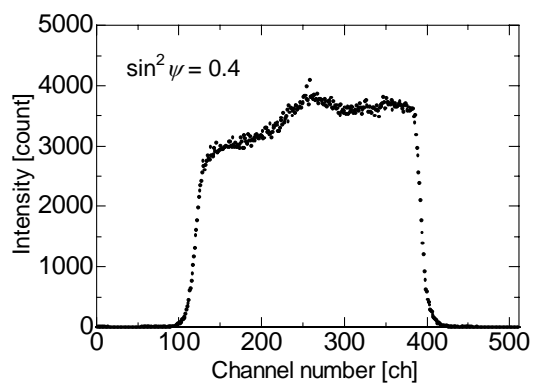
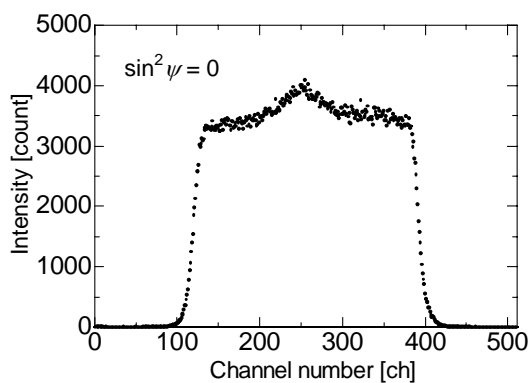
Profile



$\sin^2 \psi$ 線図



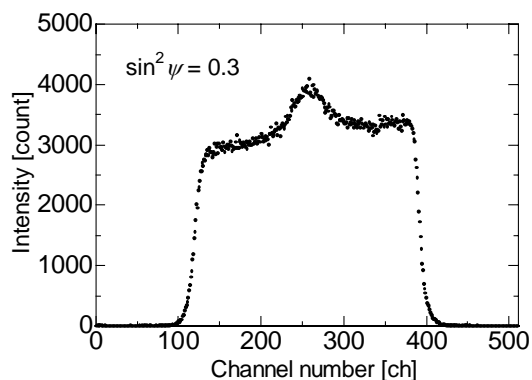
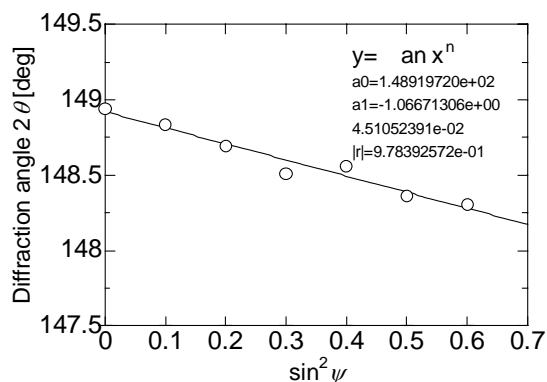
Profile



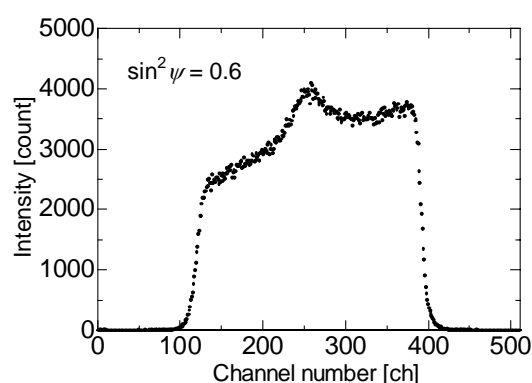
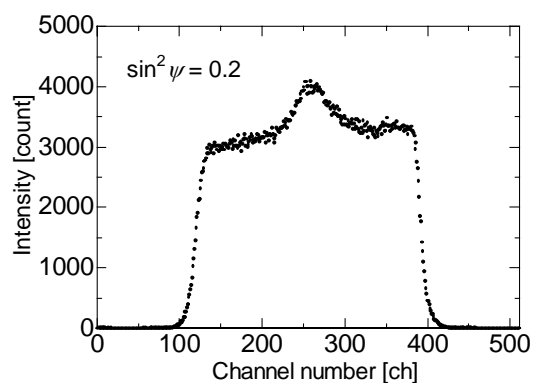
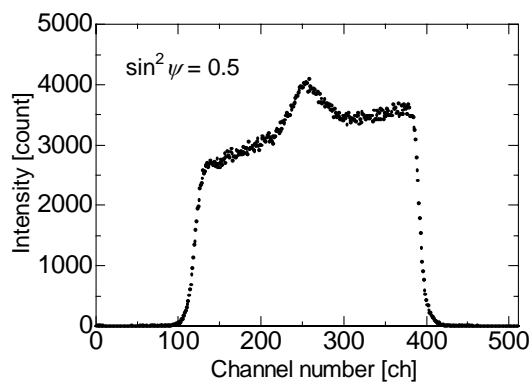
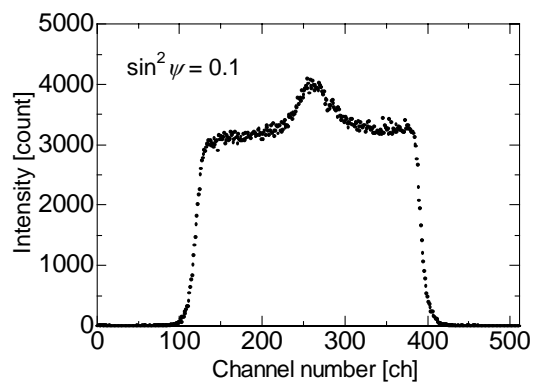
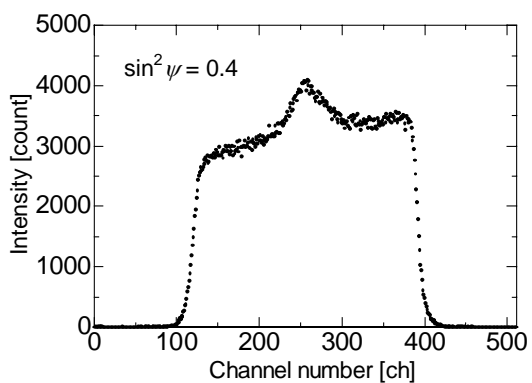
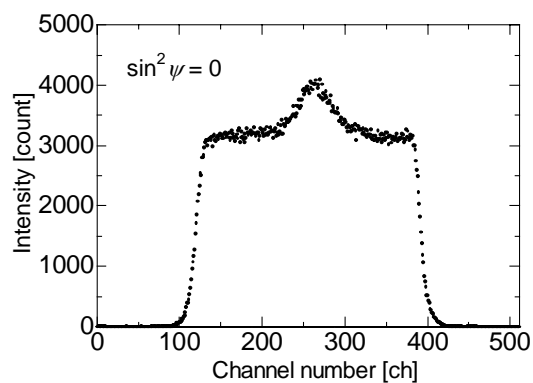
SUS304-3_Cr 溶接線方向

熱影響部 (x=-7 mm)

$\sin^2 \psi$ 線圖



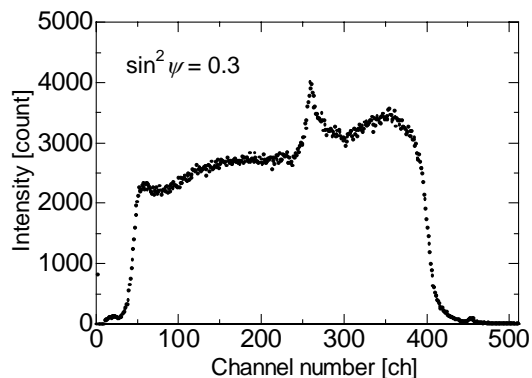
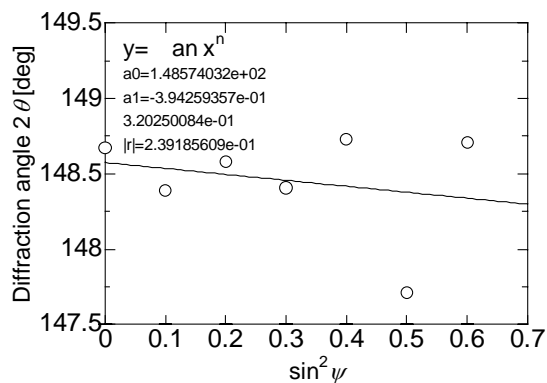
Profile



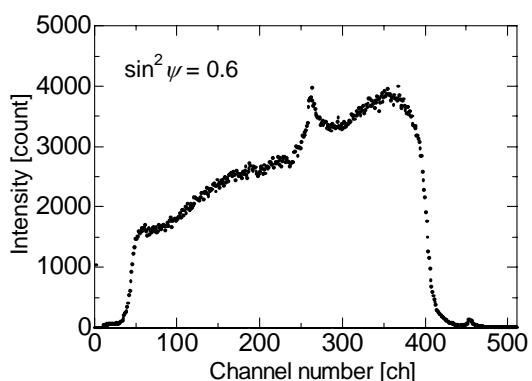
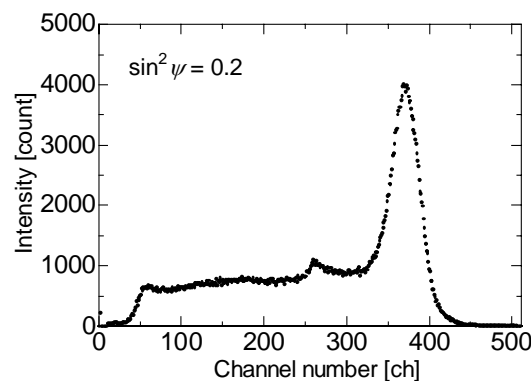
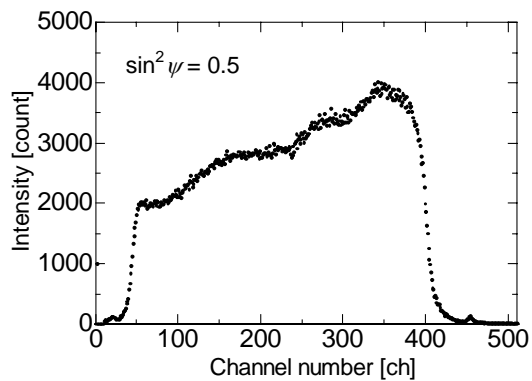
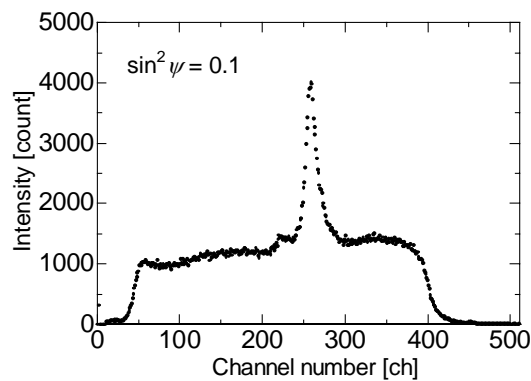
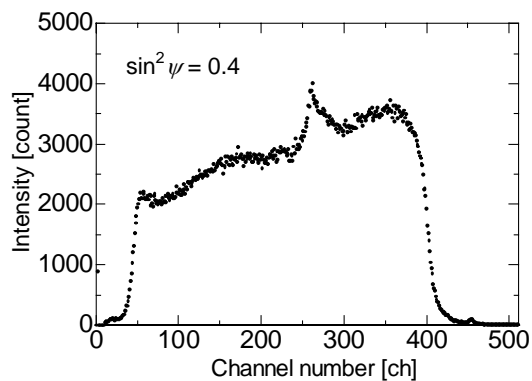
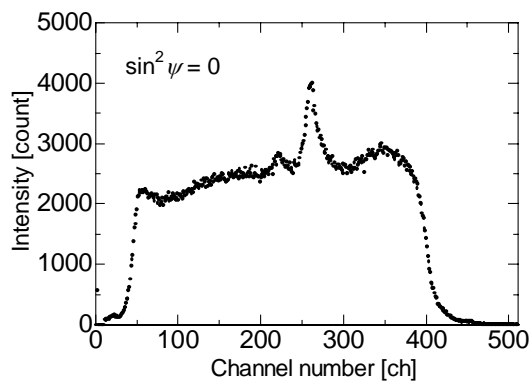
SUS304-3_Cr 溶接線方向

ヒード部 (x=0 mm)

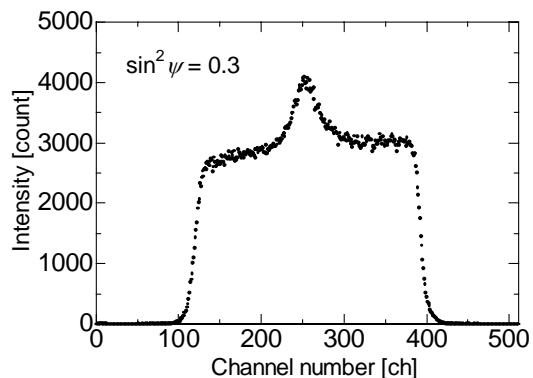
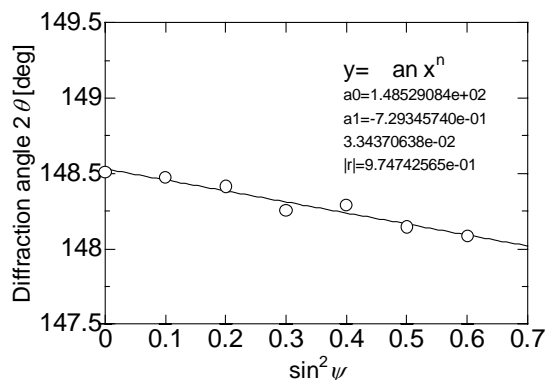
$\sin^2 \psi$ 線図



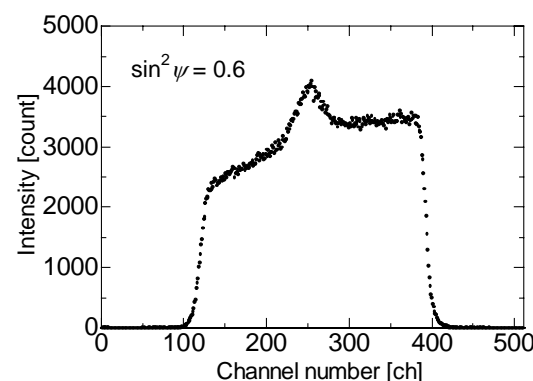
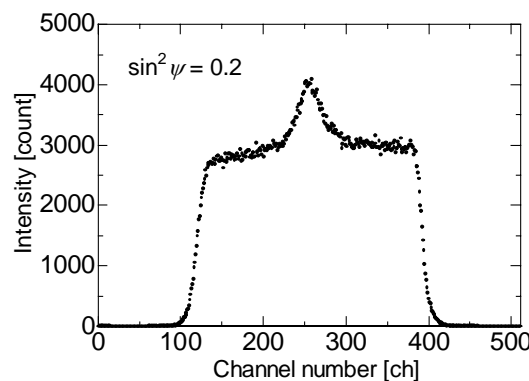
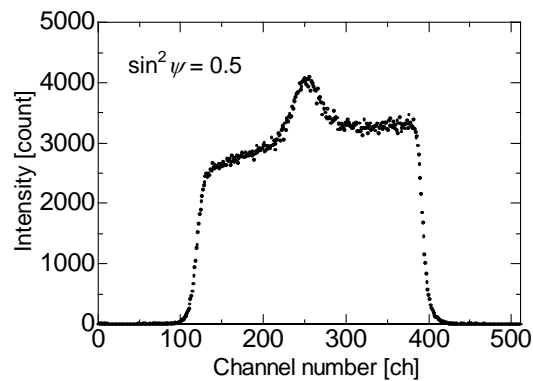
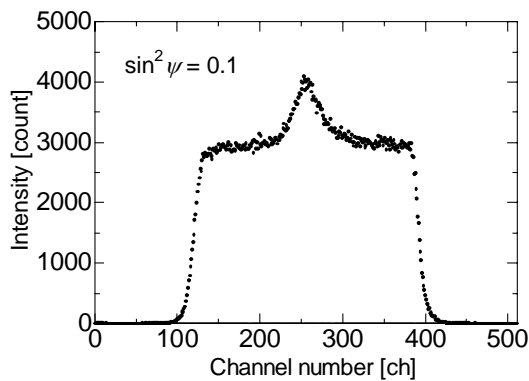
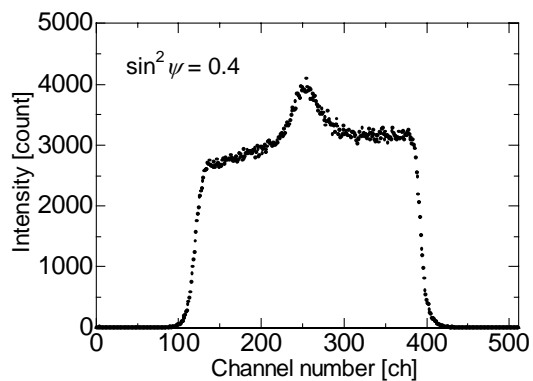
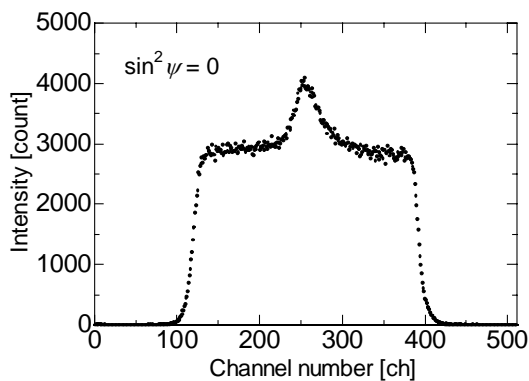
Profile



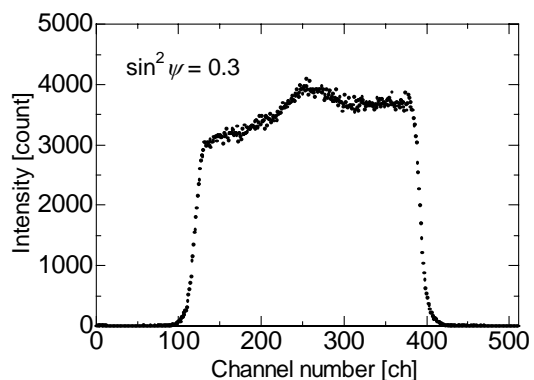
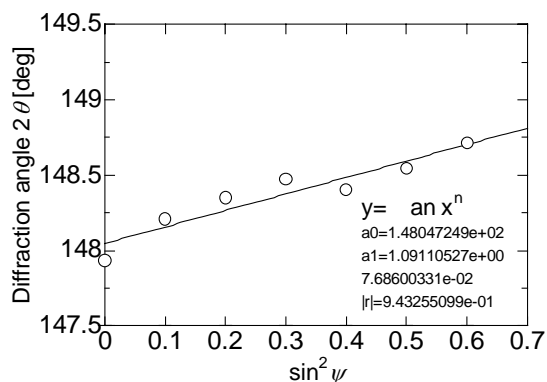
$\sin^2 \psi$ 線圖



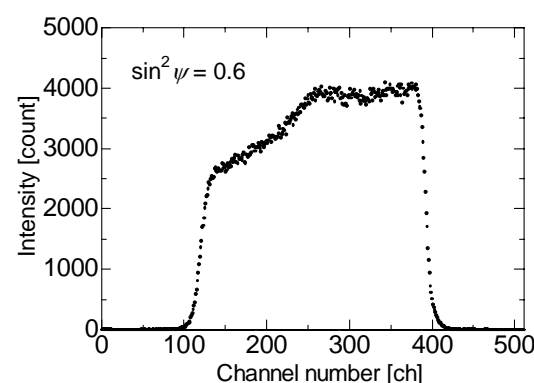
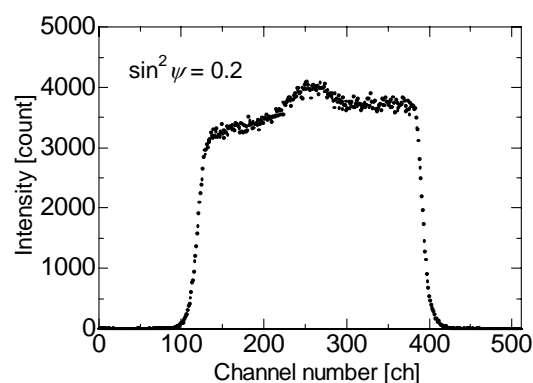
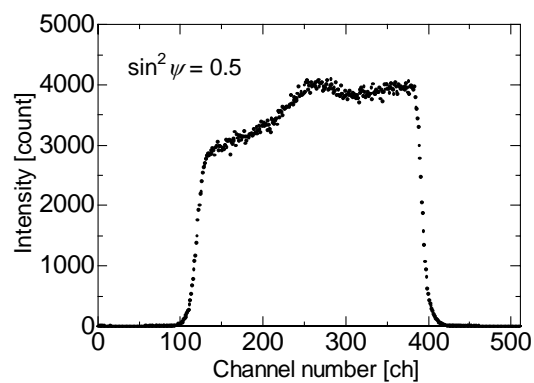
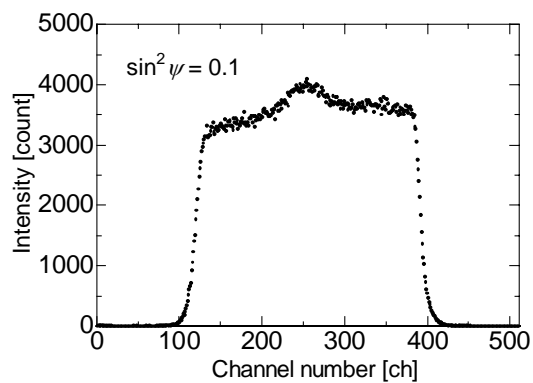
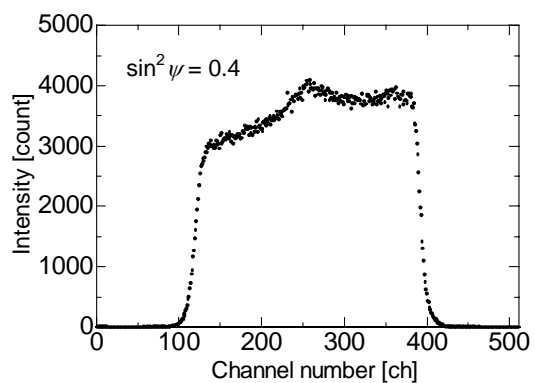
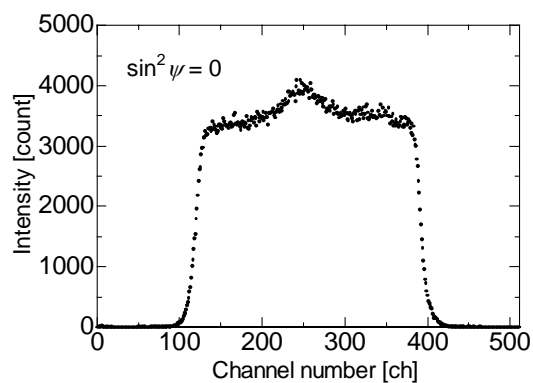
Profile



$\sin^2 \psi$ 線図



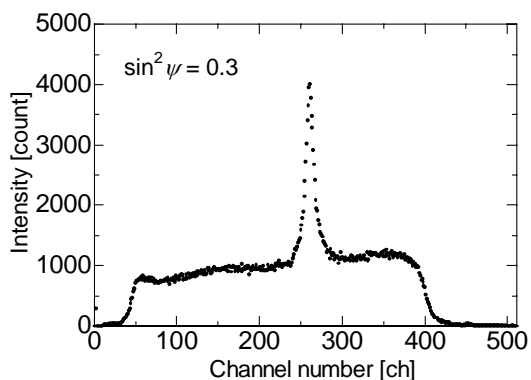
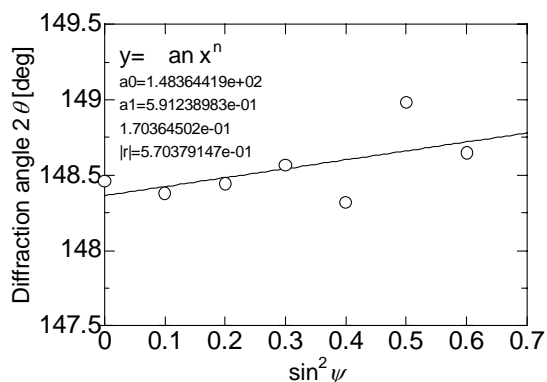
Profile



SUS304-3_Cr 溶接線方向

止端部付近 (x=3.5 mm)

$\sin^2 \psi$ 線図



Profile

