

Table II-10 Residual life assessment results

Components	Location	Material	Region	Evaluation results		
				Creep life consumption ratio (%)	Residual life (hr)	Evaluated residual life (h)
Final SH Outlet Header	Circumferential weld at right side	SA 335 P22	Base Metal	4	3,338,000	270,000
			Fine grain HAZ	1 ~ 4	3,338,000 ~ 13,771,000	
			Coarse grain HAZ	9 ~ 20	556,000 ~ 1,406,000	
De-Suerheater-Left	Circumferential weld	SA 335 P12	Base Metal	16 ~ 31	310,000 ~ 730,000	96,000
			Coarse grain HAZ	0 ~ 42	192,000 <	
De-Suerheater-Right	Circumferential weld	SA 335 P12	Base Metal	16 ~ 31	310,000 ~ 730,000	96,000
			Coarse grain HAZ	0 ~ 42	192,000 <	
RH Outlet Header	Circumferential weld at left side	SA 335 P22	Base Metal	2 ~ 6	2,179,000 ~ 6,816,000	700,000
			Fine grain HAZ	7 ~ 9	1,406,000 ~ 1,848,000	
			Coarse grain HAZ	3 ~ 6	2,179,000 ~ 4,498,000	
	Circumferential weld at right side,top	SA 335 P22	Base Metal	2 ~ 6	2,179,000 ~ 6,816,000	270,000
			Fine grain HAZ	9 ~ 14	854,000 ~ 1,406,000	
			Coarse grain HAZ	6 ~ 20	556,000 ~ 2,179,000	
	Circumferential weld at right side,front	SA 335 P22	Base Metal	2	6,816,000	270,000
			Fine grain HAZ	9 ~ 14	854,000 ~ 1,406,000	
			Coarse grain HAZ	6 ~ 20	556,000 < 2,179,000	
Main Steam Pipe-Right	Circumferential weld,intrados	SA 335 P22	(Base Metal)※4	(34) ~ (74)	(49,000) ~ (270,000)	69,000 (24,000※4)
			(Fine grain HAZ)※4	(13) ~ (42)	(192,000) ~ (931,000)	
			Coarse grain HAZ	32 ~ 50	139,000 ~ 296,000	
	Circumferential weld,near the stop valve	SA 335 P22	(Base Metal)※4	(34) ~ (89)	(17,000) ~ (270,000)	270,000 (8,000※4)
			(Fine grain HAZ)※4	(13) ~ (42)	(192,000) ~ (931,000)	
			Coarse grain HAZ	0 ~ 20	556,000 <	
Hot Reheat Pipe-Right	Circumferential weld	SA 335 P22	Base Metal	6 ~ 16	730,000 ~ 2,179,000	240,000
			Fine grain HAZ	19 ~ 22	493,000 ~ 593,000	
			Coarse grain HAZ	14 ~ 20	556,000 ~ 854,000	

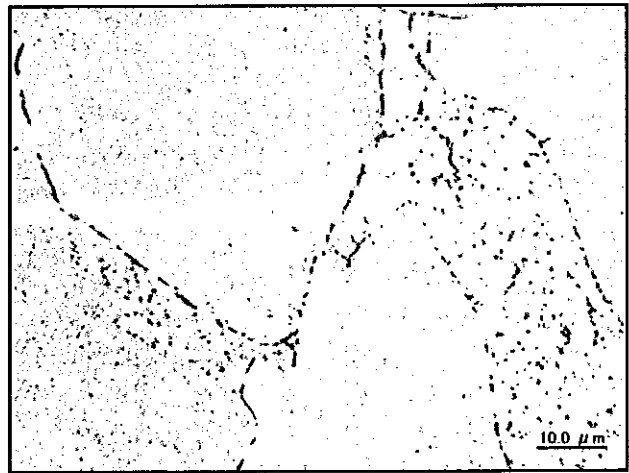
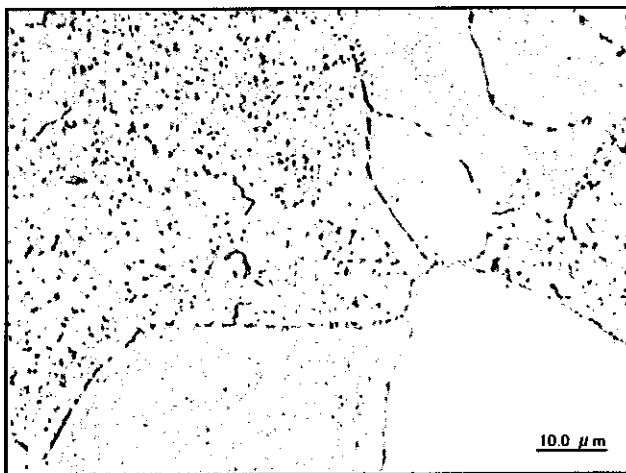
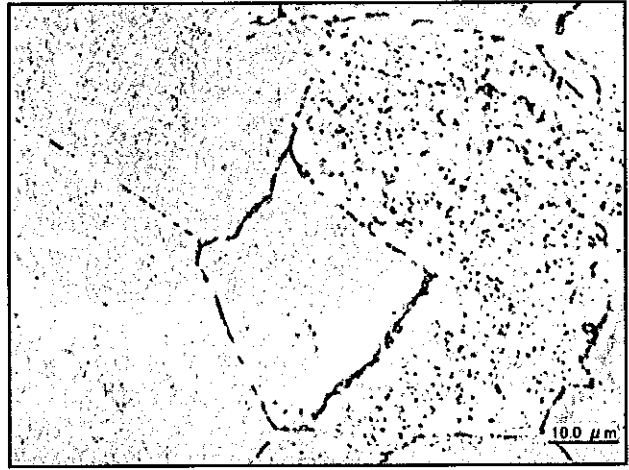
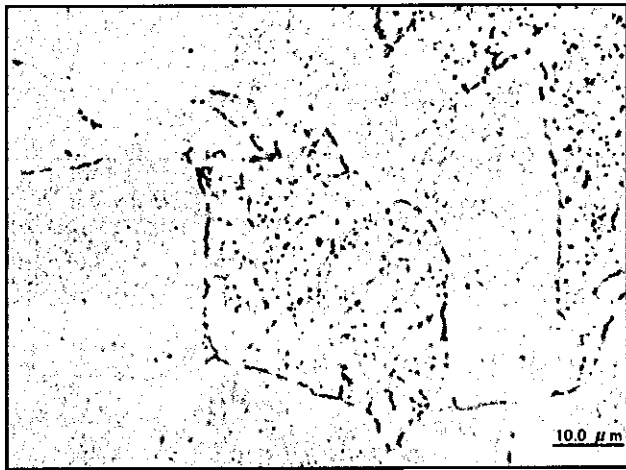
※1 : Residual life was evaluated with microstructural comparison method of KYUSHIYU ELECTRIC POWER CO.,INC. RESEARCH LABORATORY.

※2 : Residual life = (Cumulative operation hours / Creep life consumption ratio) × 100 - Cumulative operation hours.

※3 : Evaluated residual life is half of residual life based on Japanese guideline of boiler residual life assessment.

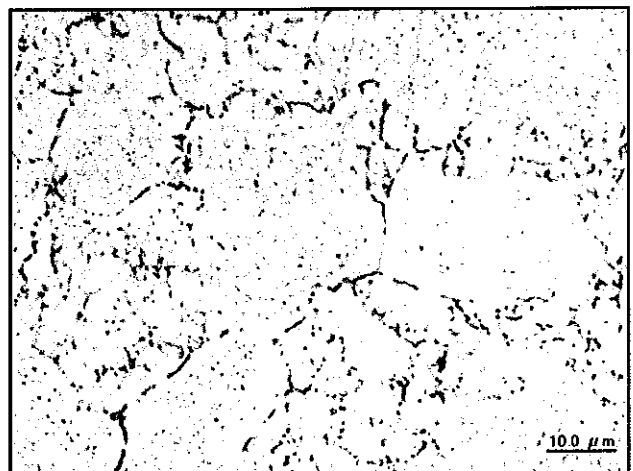
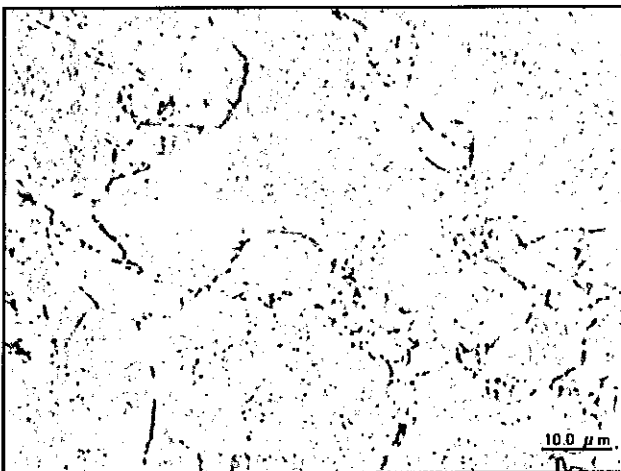
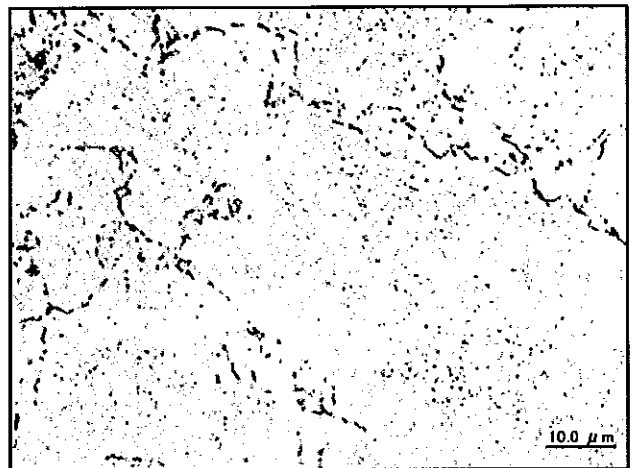
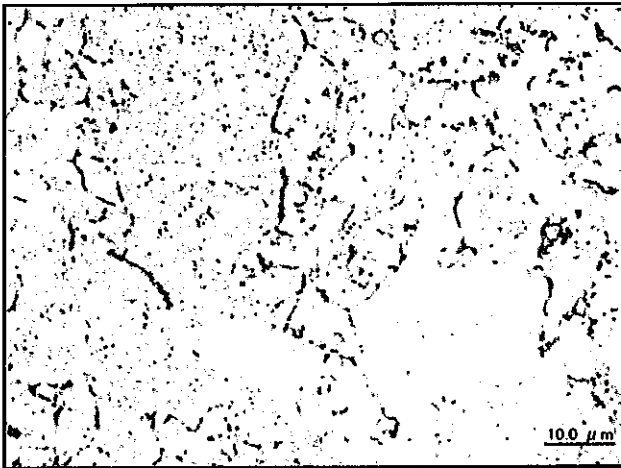
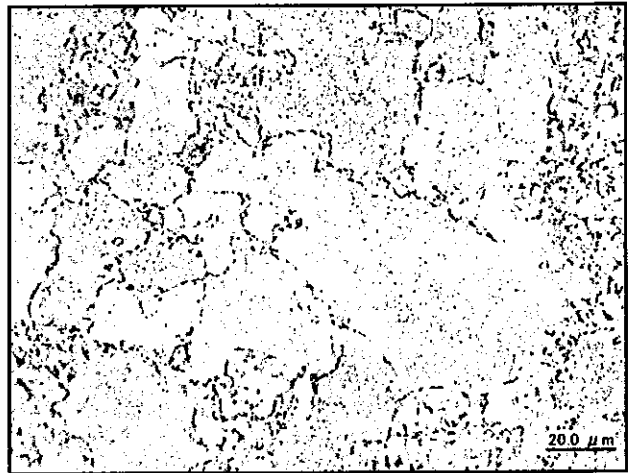
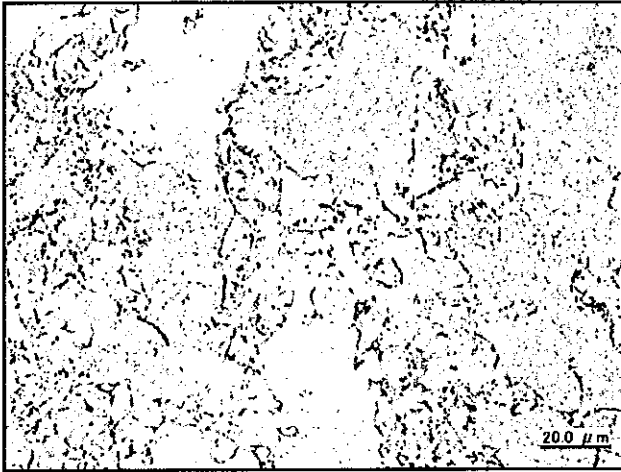
Evaluated residual life = Residual life / 2

※4 : Regarded as reference for OD measurement was not carried out.



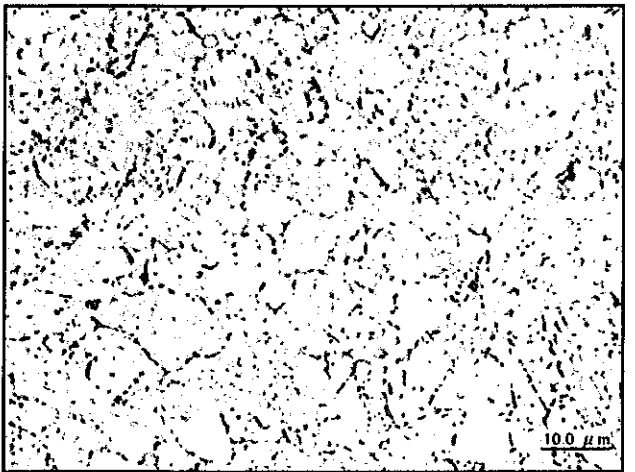
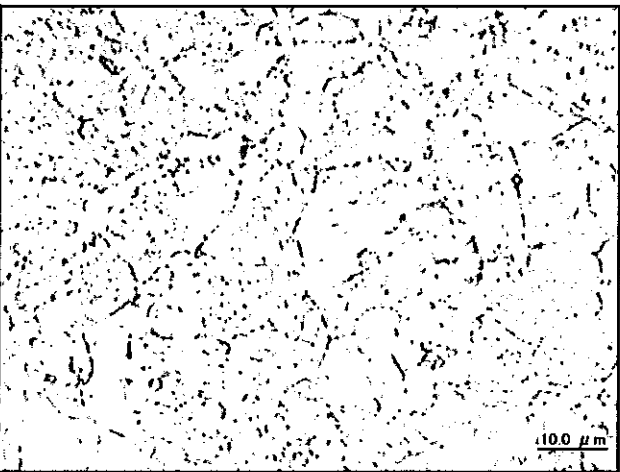
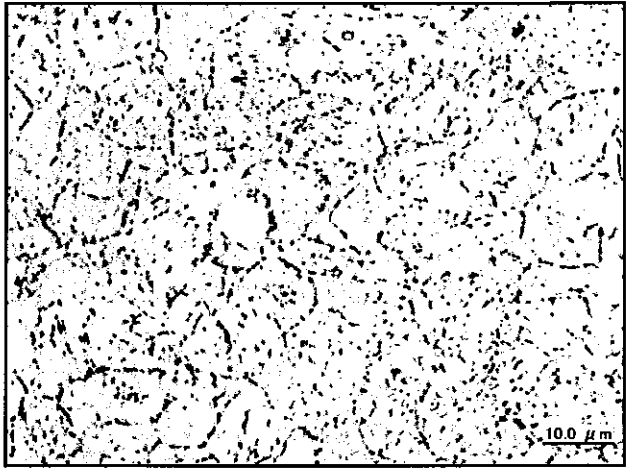
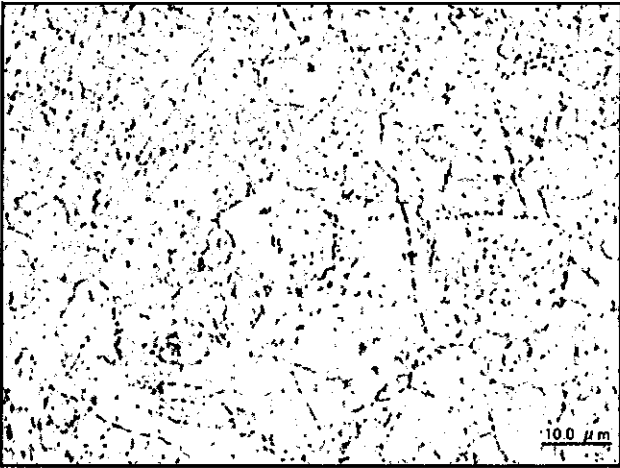
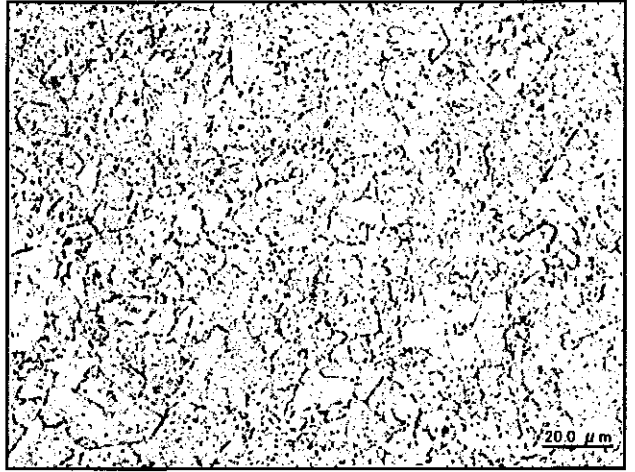
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Photo II-4-1 Microstructure observation
Final SH Outlet Header (Circumferential weld at right side : Base metal)



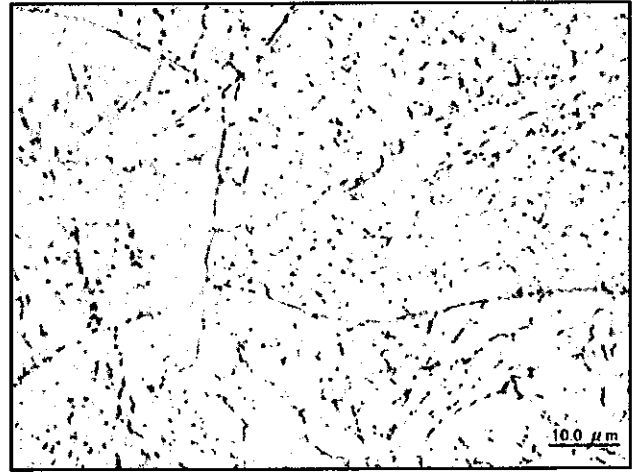
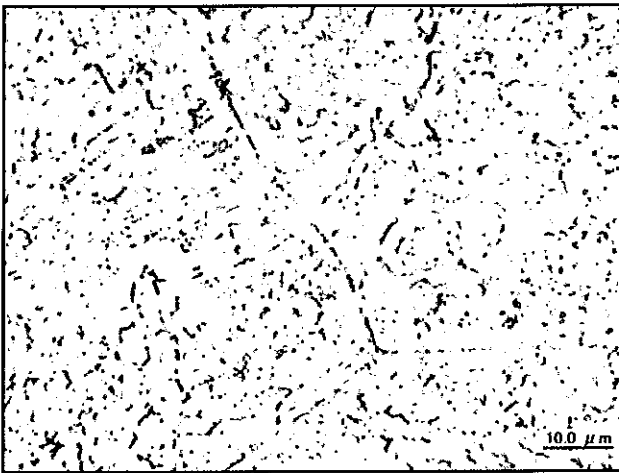
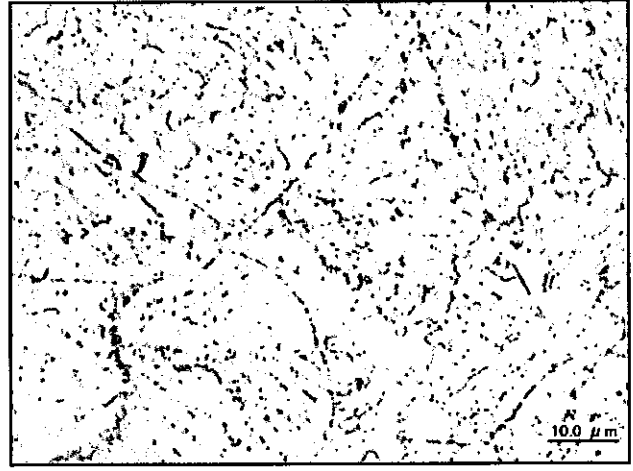
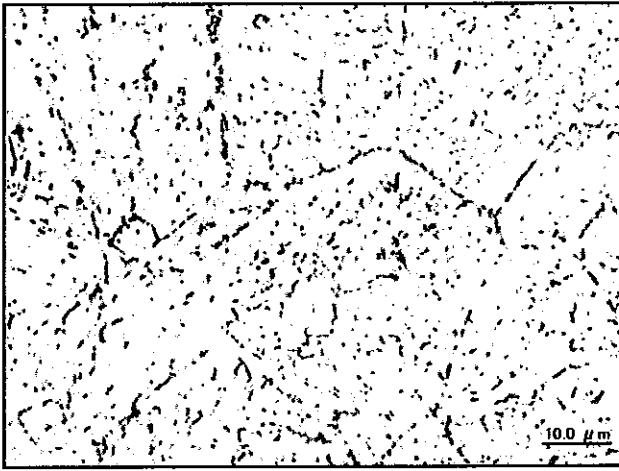
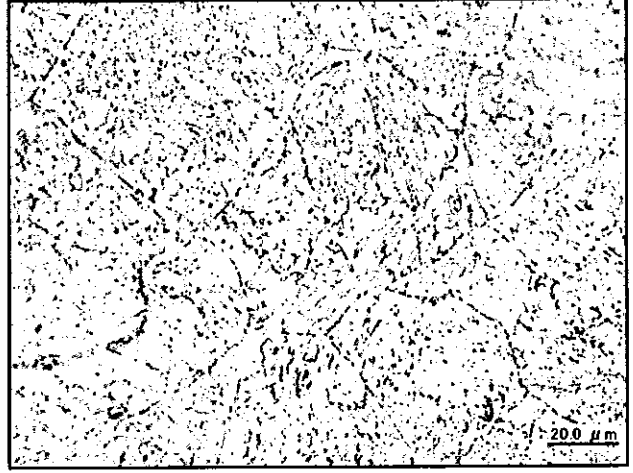
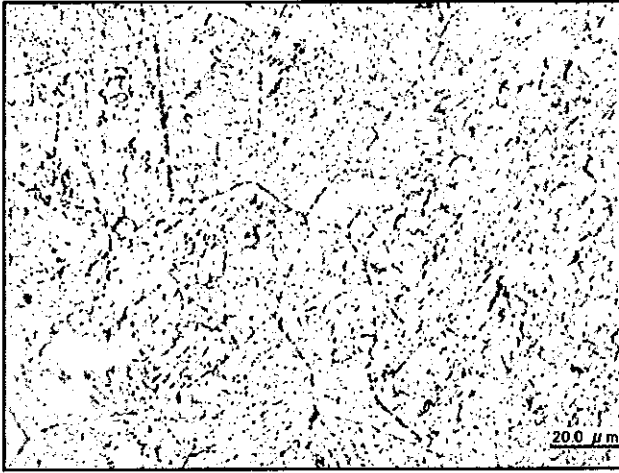
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Photo II-4-2 Microstructure observation
Final SH Outlet Header (Circumferential weld at right side : Intercritical zone)



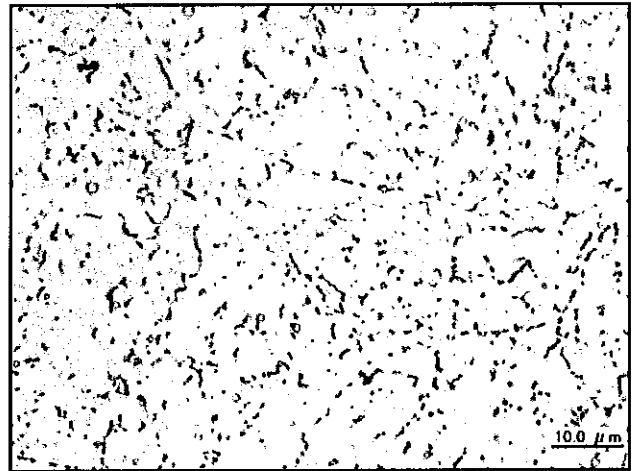
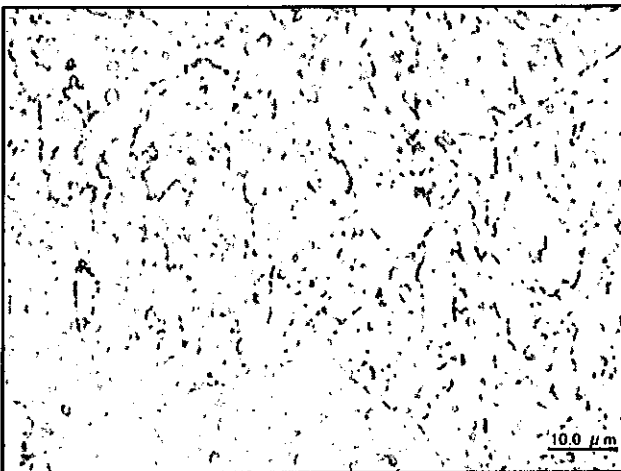
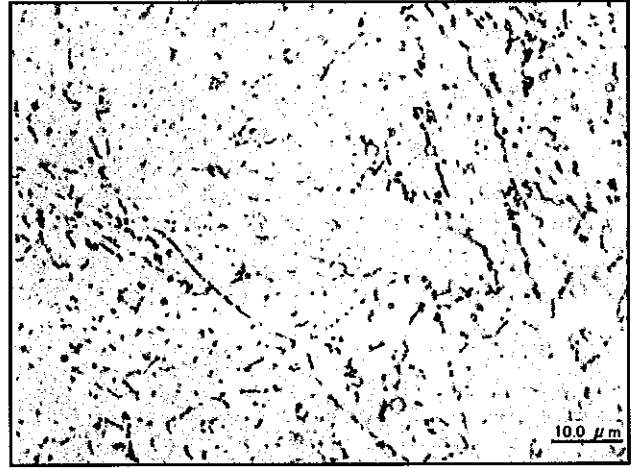
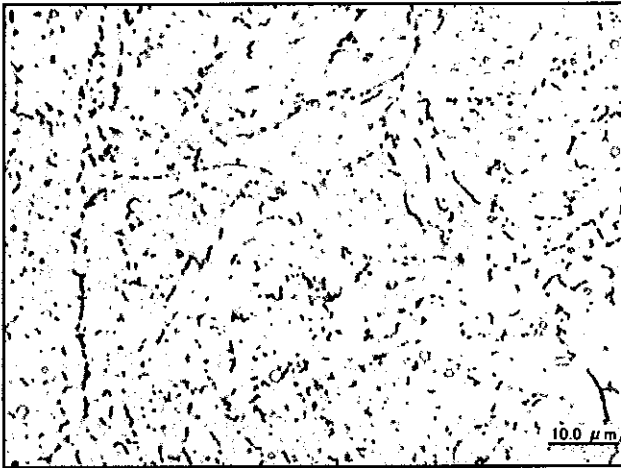
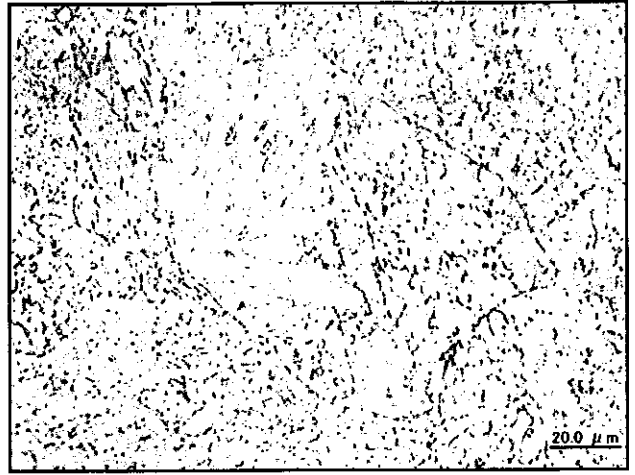
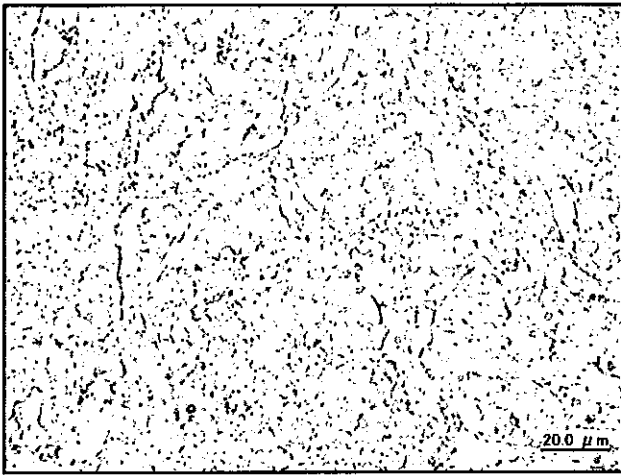
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Photo II-4-3 Microstructure observation
Final SH Outlet Header (Circumferential weld at right side : Fine grain HAZ)



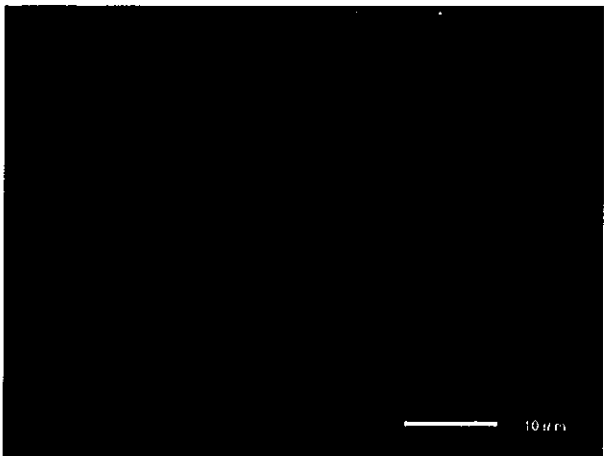
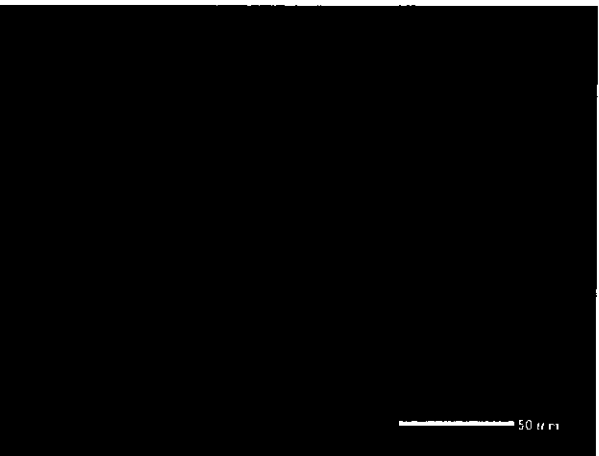
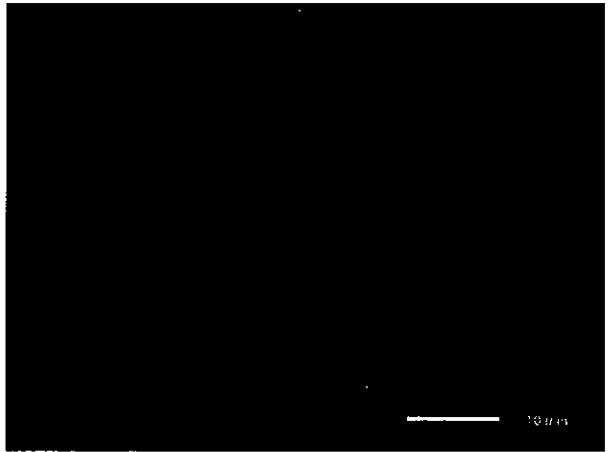
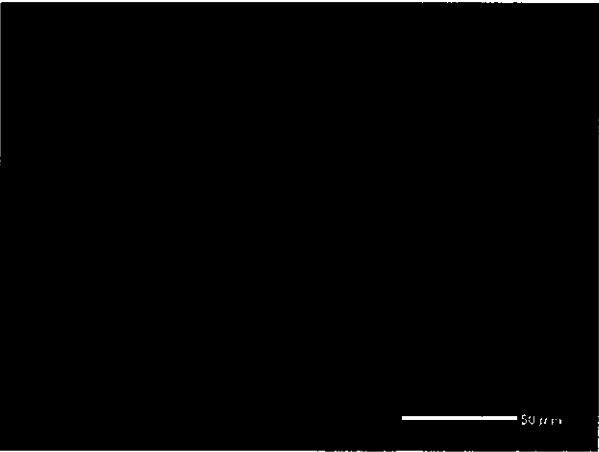
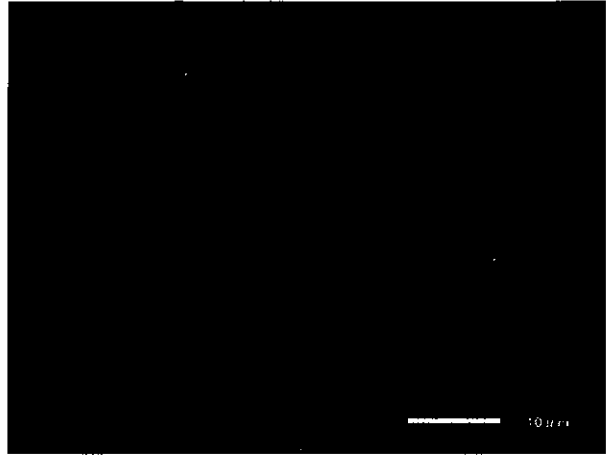
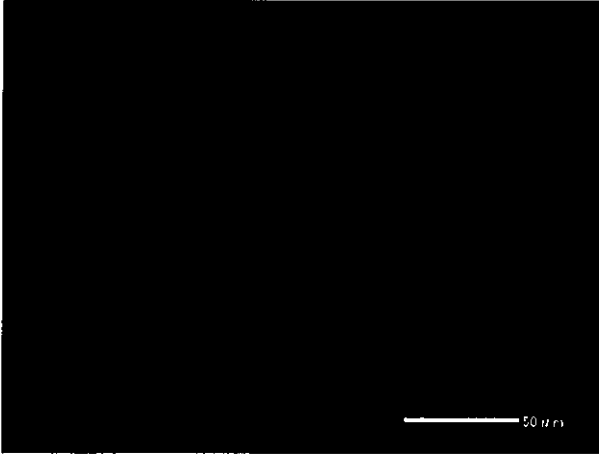
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Photo II-4-4 Microstructure observation
Final SH Outlet Header (Circumferential weld at right side : Coarse grain HAZ)



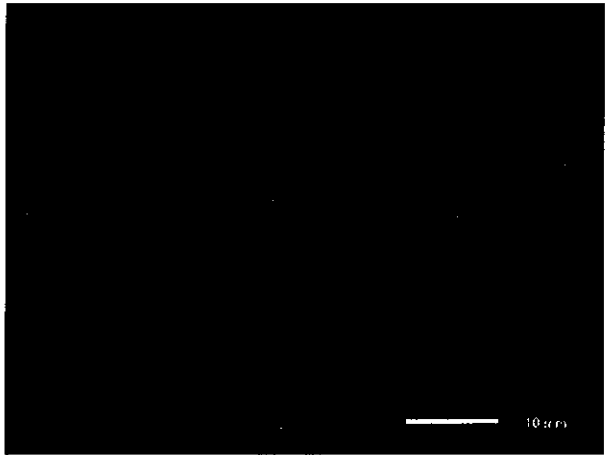
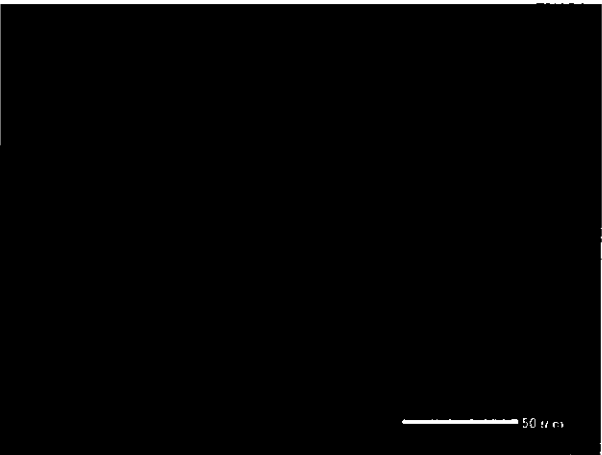
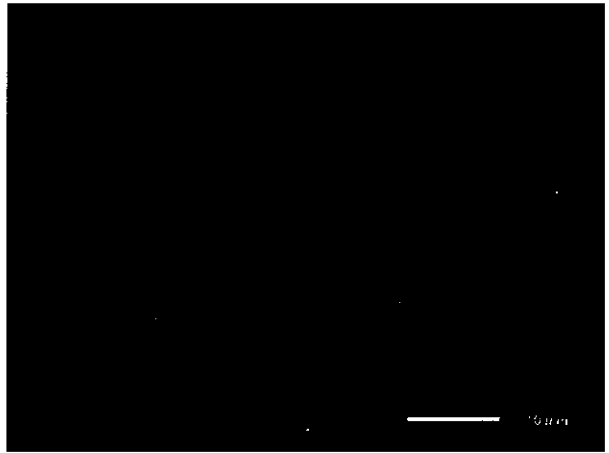
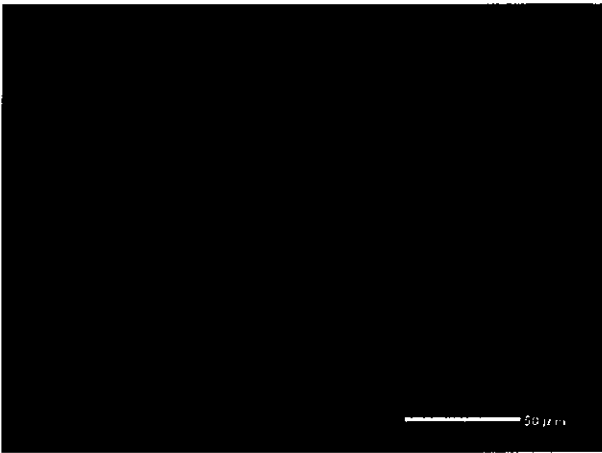
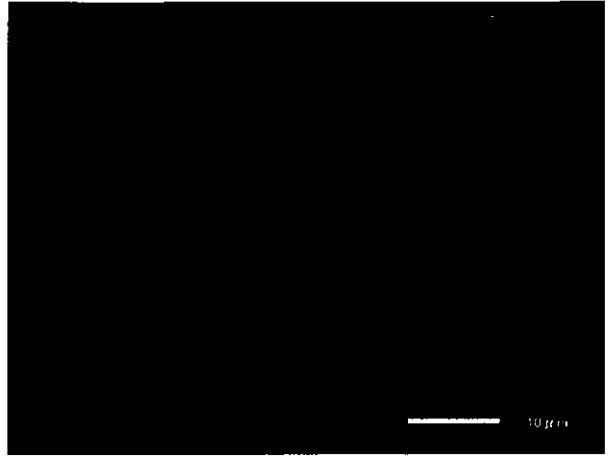
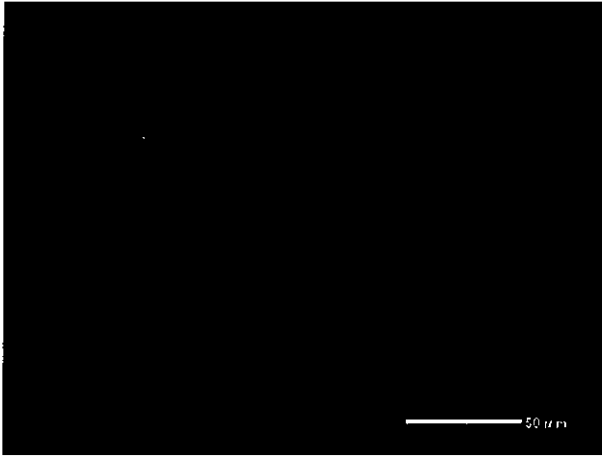
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Photo II-4-5 Microstructure observation
Final SH Outlet Header (Circumferential weld at right side : Weld metal)



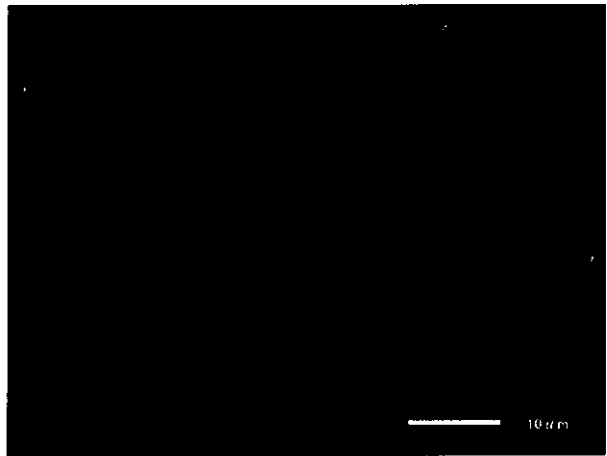
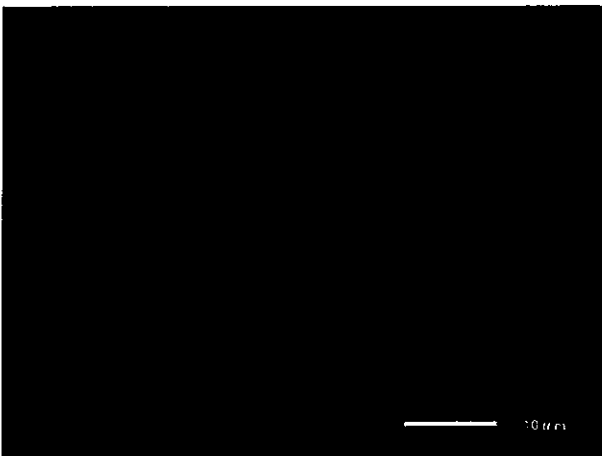
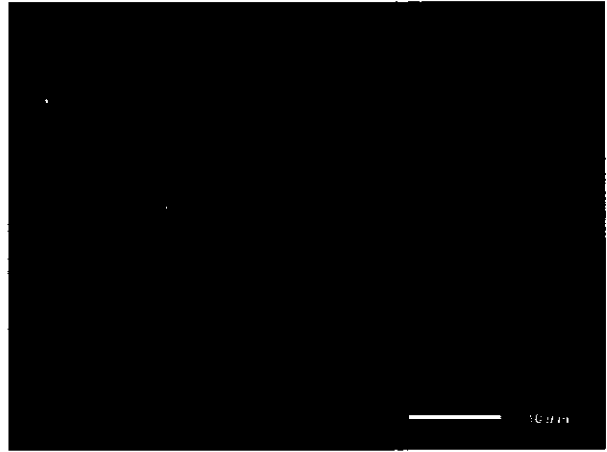
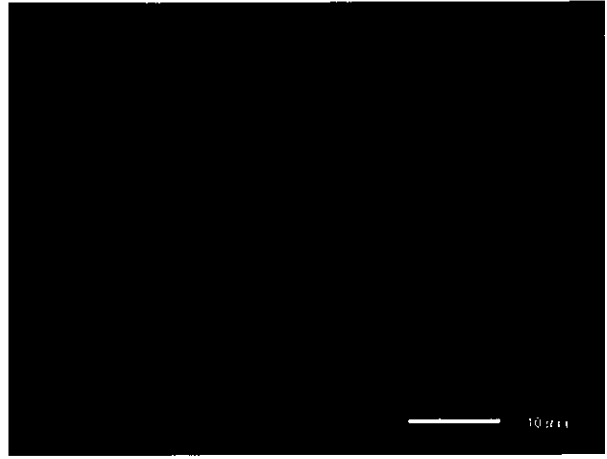
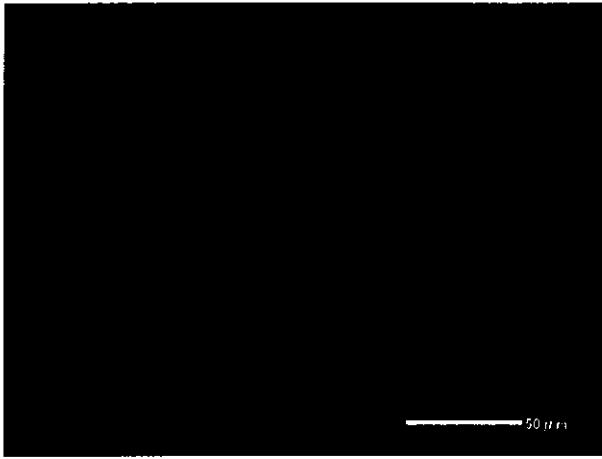
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Photo II-4-6 SEM(Scanning electron microscope) observation
Final SH Outlet Header(Circumferential weld at right side : Fine grain HAZ)



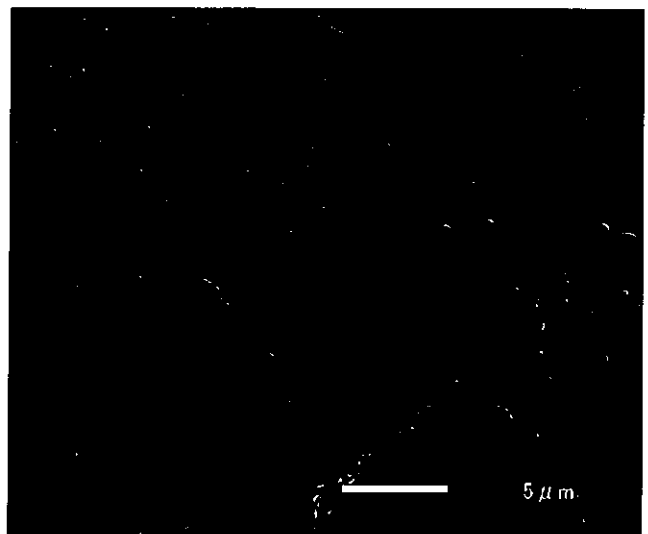
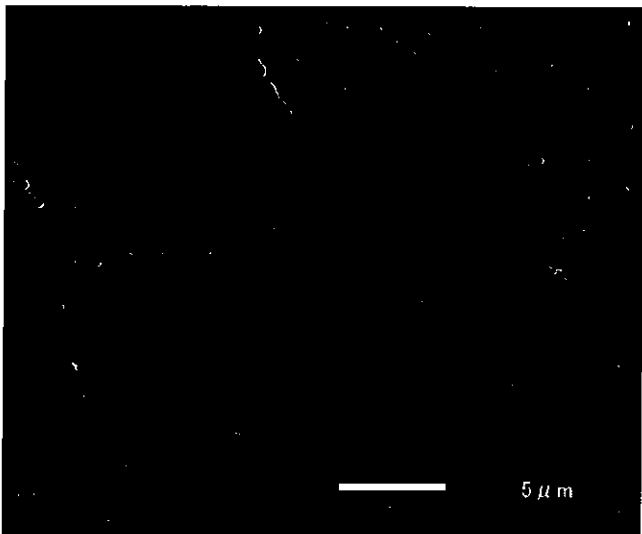
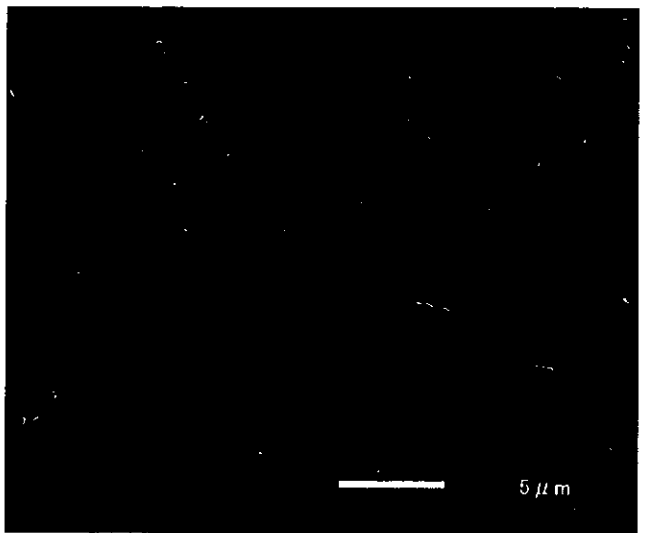
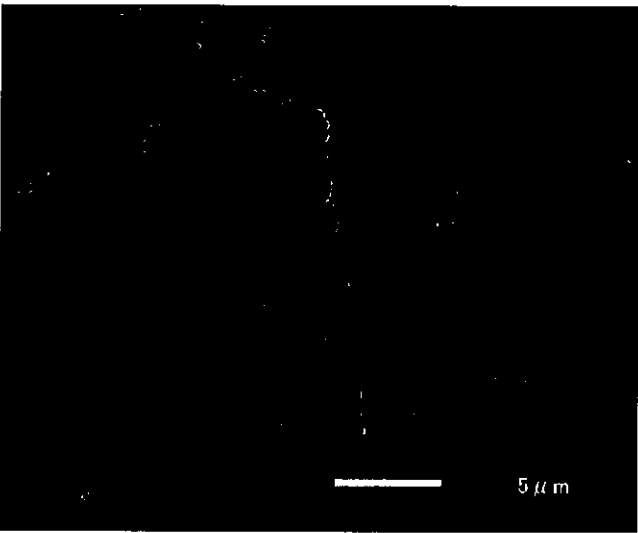
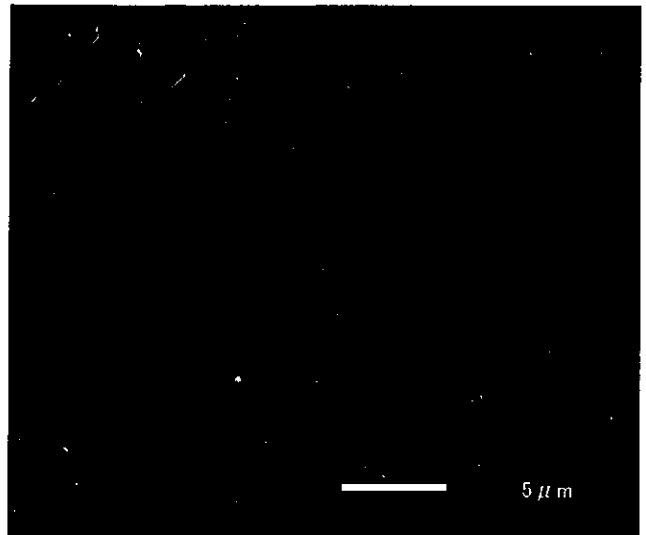
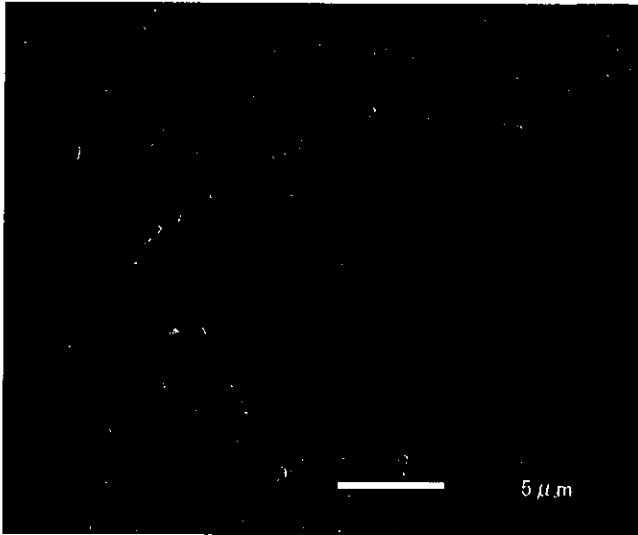
35/

Photo II-4-7 SEM(Scanning electron microscope) observation
Final SH Outlet Header(Circumferential weld at right side : Coarse grain HAZ)



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Photo II-4-8 SEM(Scanning electron microscope) observation
Final SH Outlet Header(Circumferential weld at right side :Weld metal)



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Photo II-4-9 Precipitates along grain boundary by SEM observation
Final SH Outlet Header (Circumferential weld at right side : Base metal)

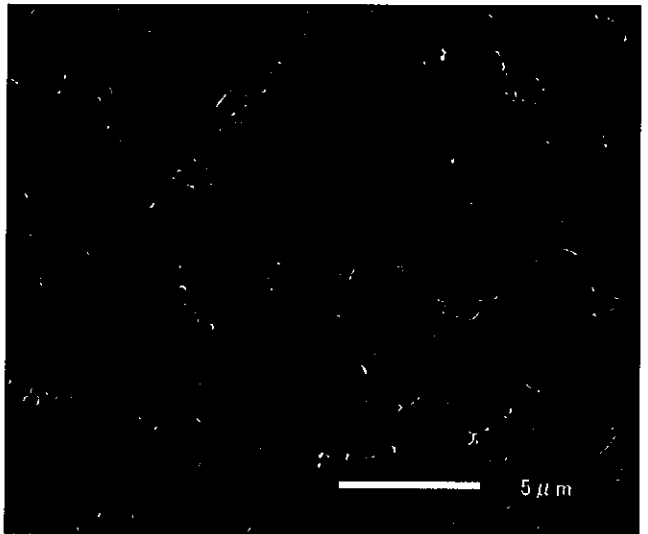
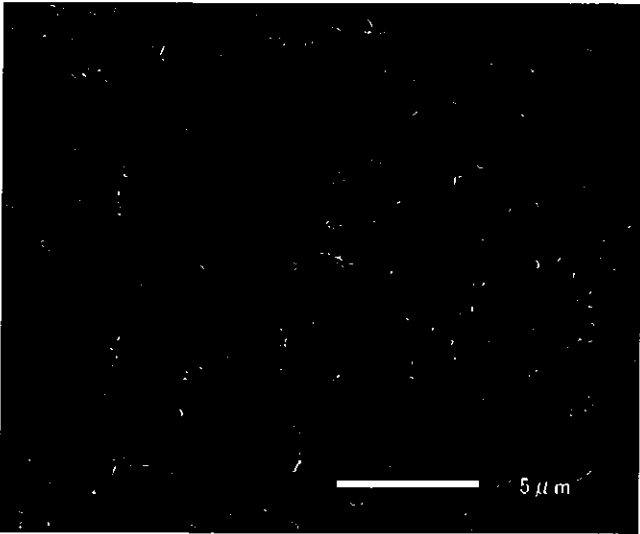
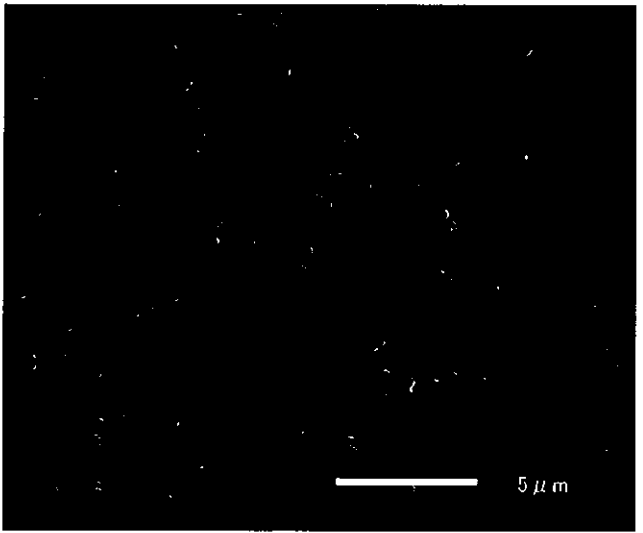
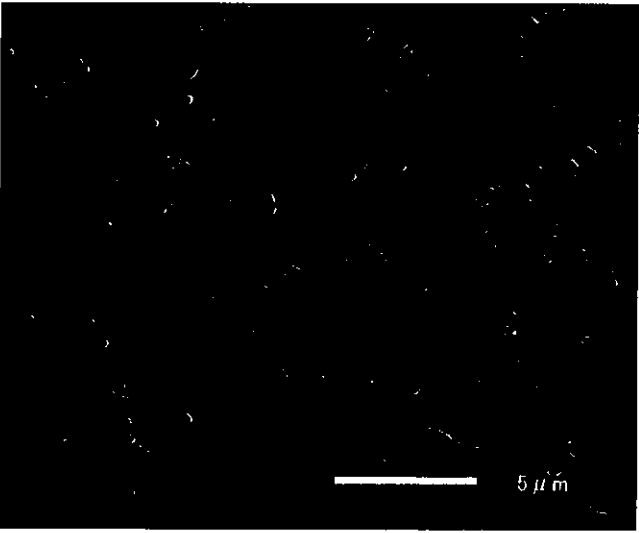
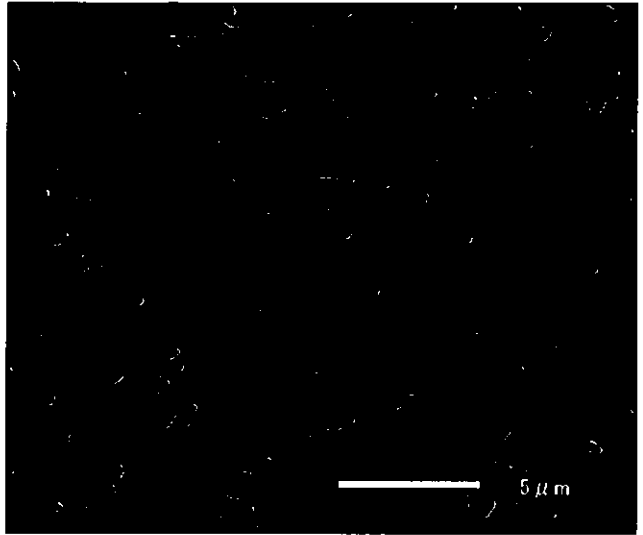
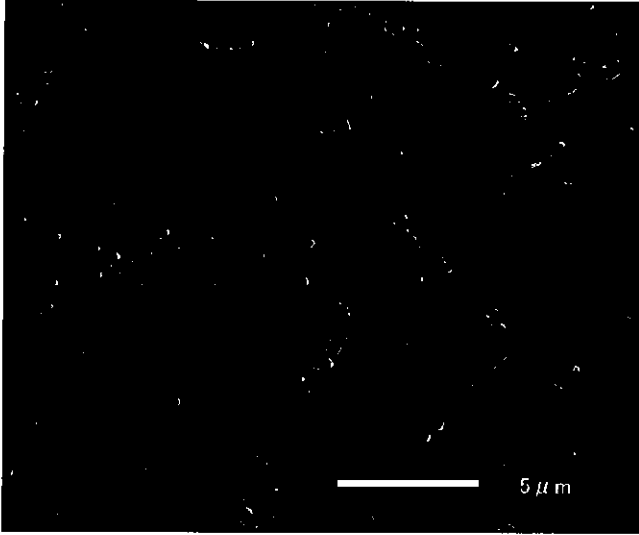
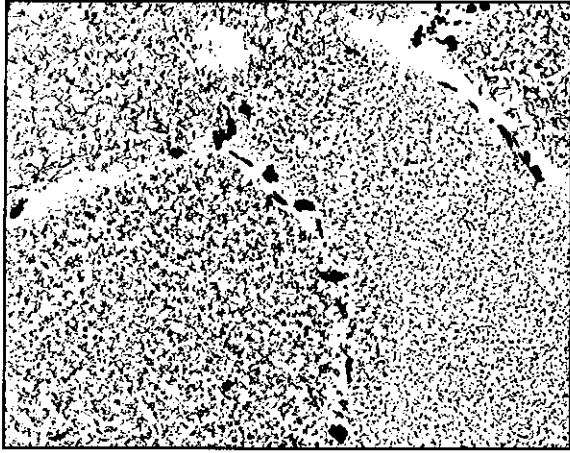
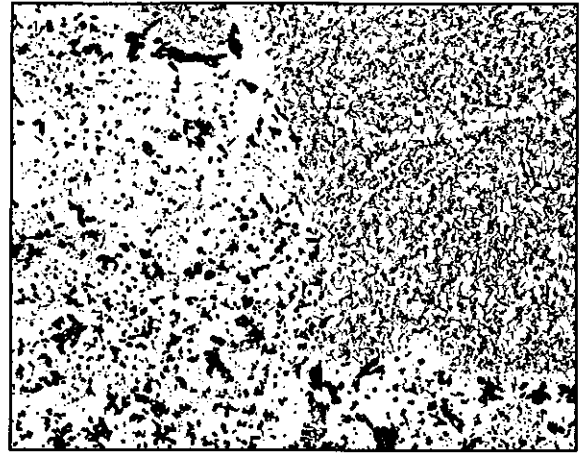


Photo II-4-10 Precipitates along grain boundary by SEM observation
Final SH Outlet Header (Circumferential weld at right side : Fine grain HAZ)

354



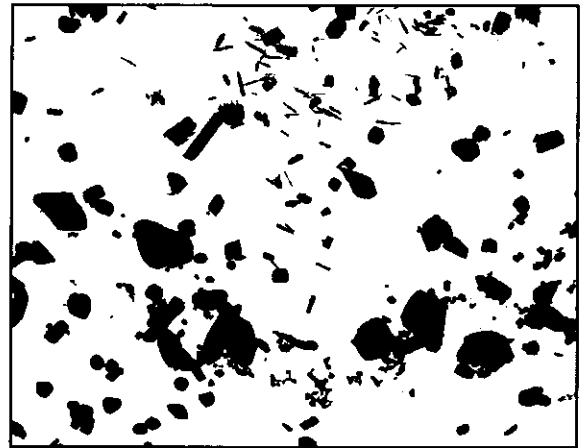
5 μm



5 μm



1 μm



1 μm



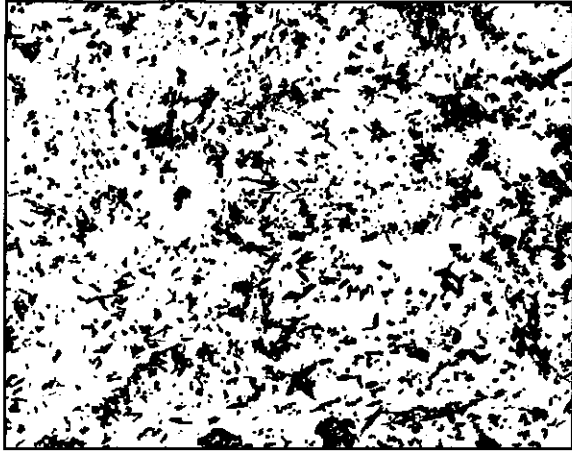
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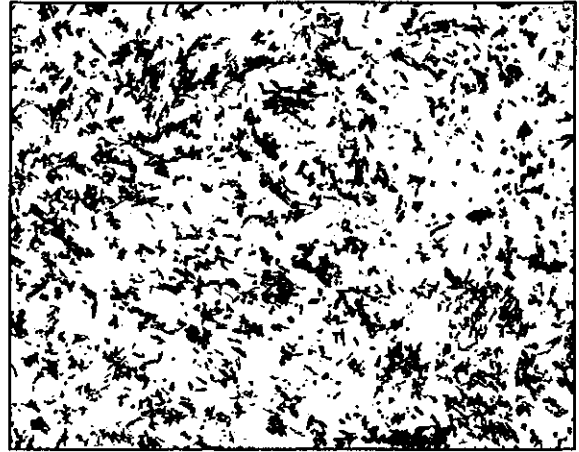
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Photo II-4-11 Precipitates by TEM (Transmission electron microscope) observation
Final SH Outlet Header (Circumferential weld at right side : Base metal)

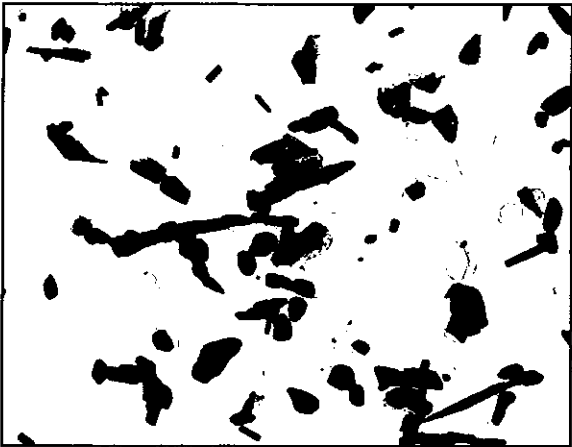
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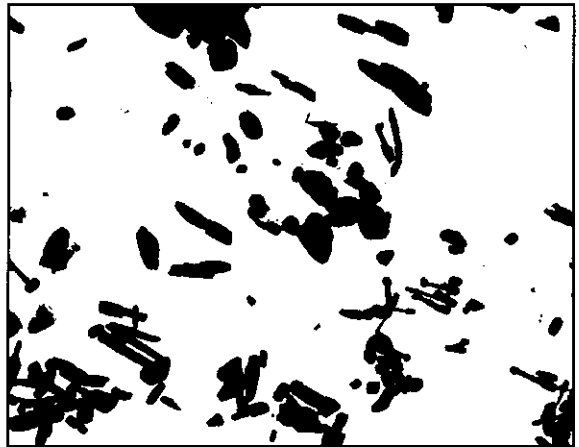
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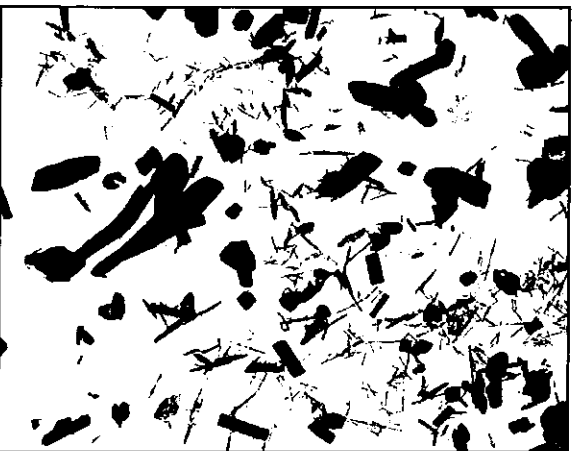
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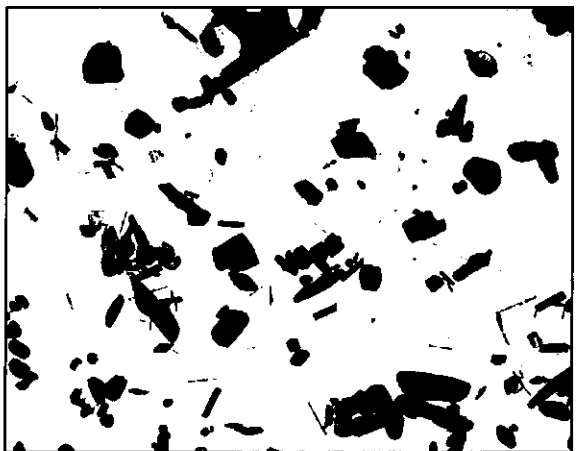
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1 μm



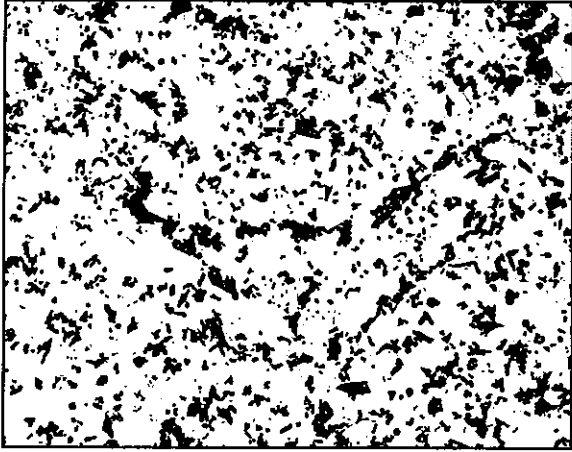
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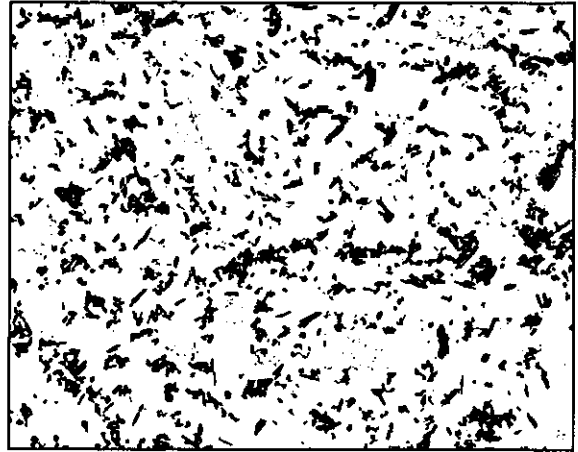
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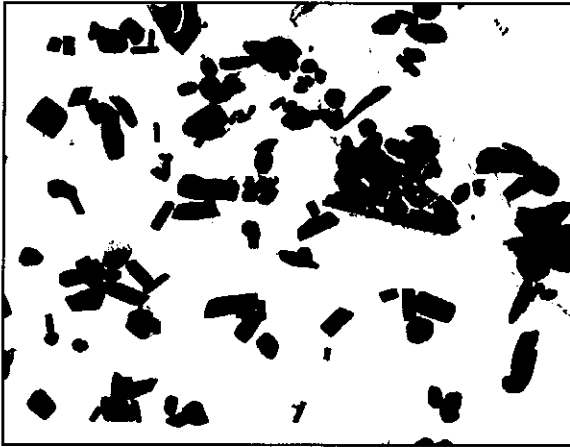
Photo II-4-12 Precipitates by TEM (Transmission electron microscope) observation
Final SH Outlet Header (Circumferential weld at right side : Fine grain HAZ)



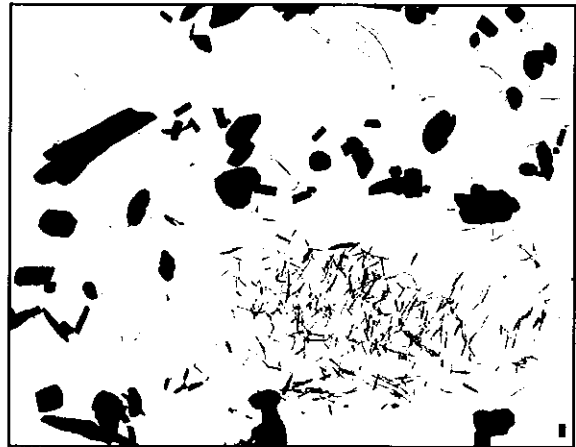
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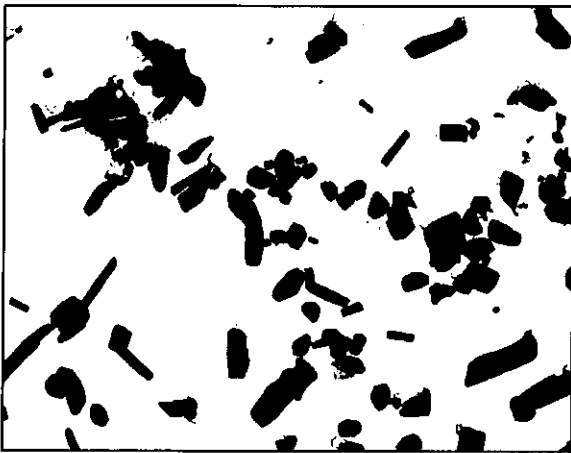
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1 μm



1 μm



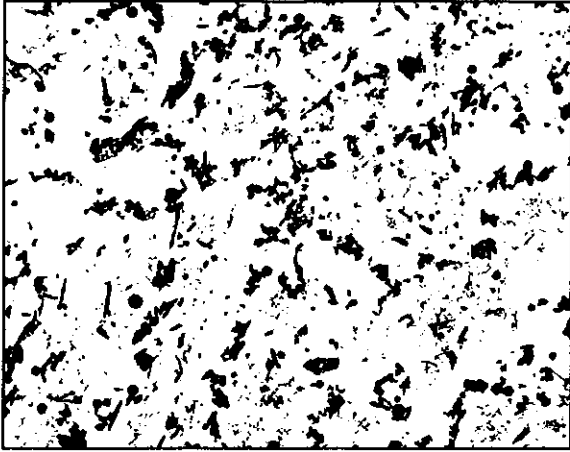
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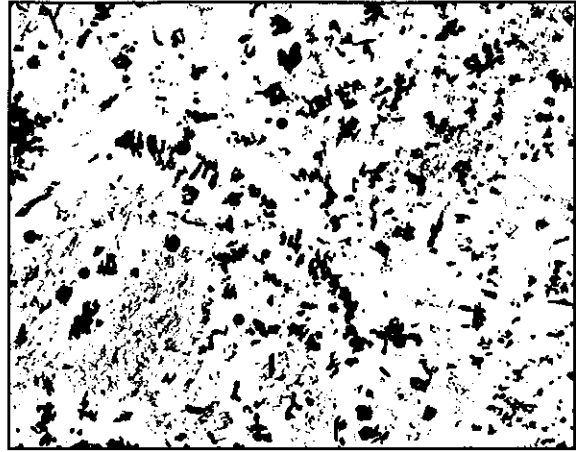
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Photo II-4-13 Precipitates by TEM (Transmission electron microscope) observation
Final SH Outlet Header (Circumferential weld at right side : Coarse grain HAZ)

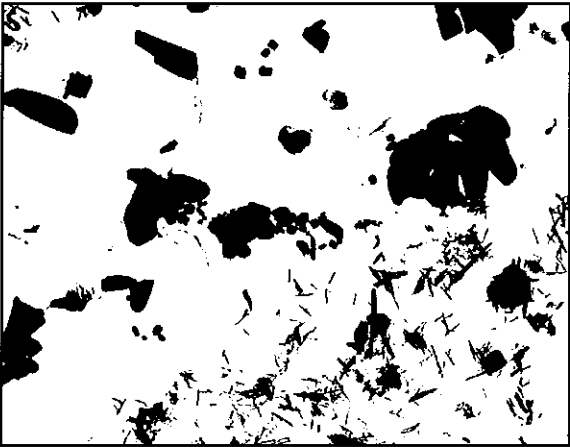
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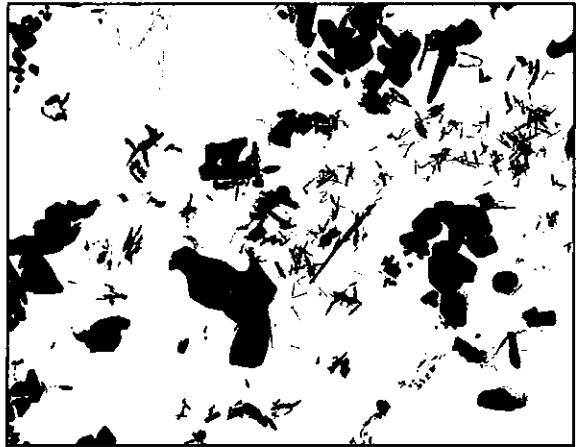
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5 μm



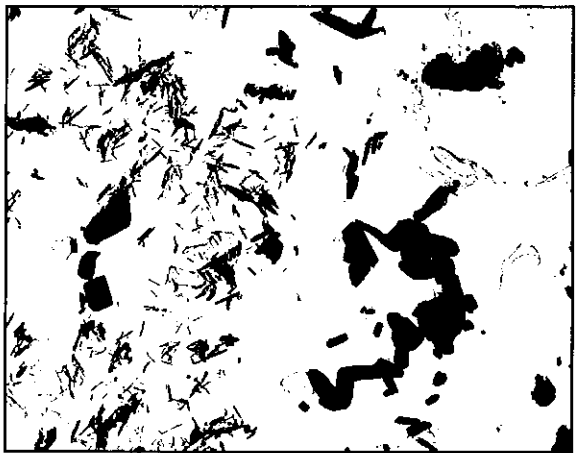
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1 μm



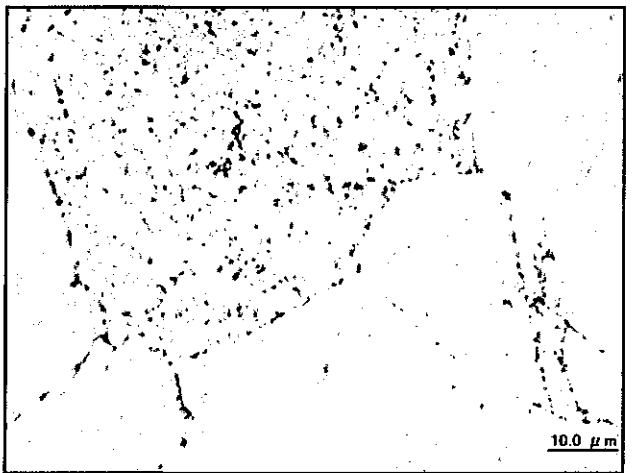
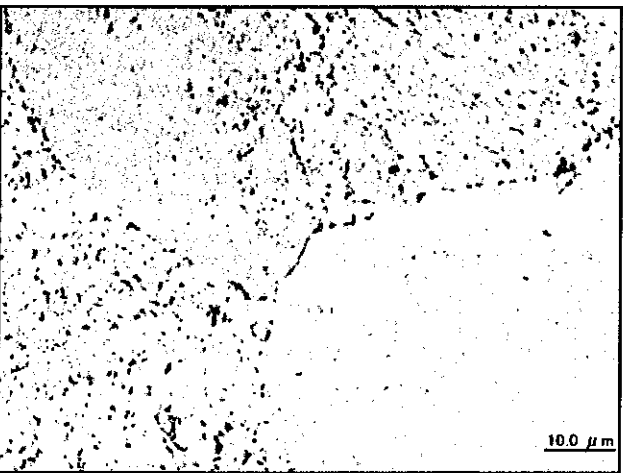
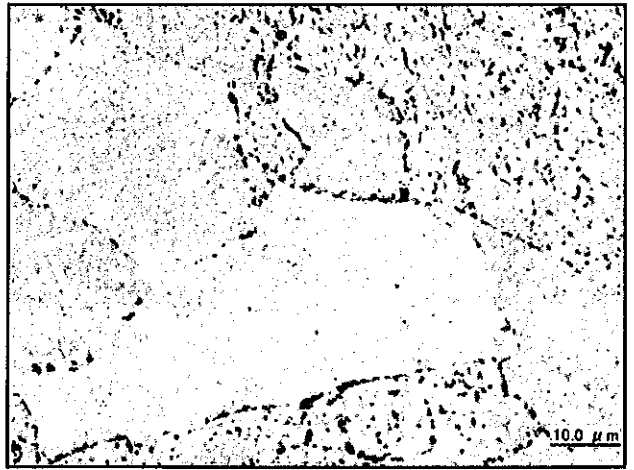
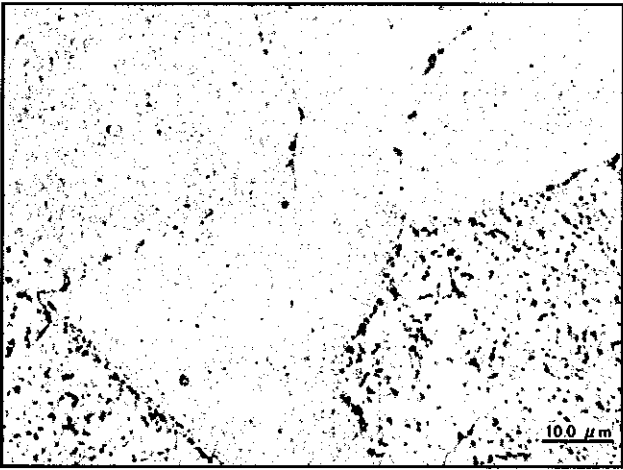
1 μm



1 μm

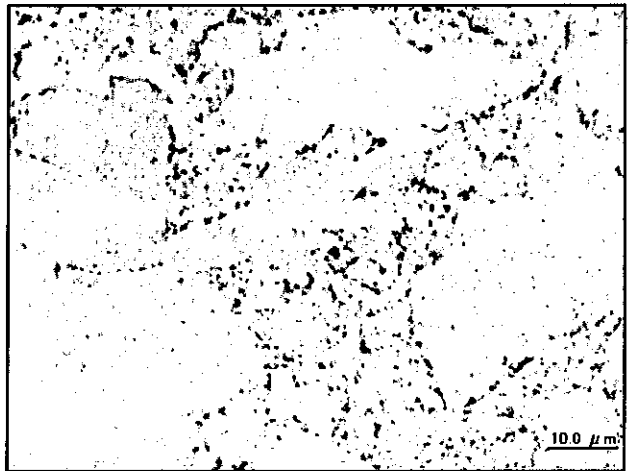
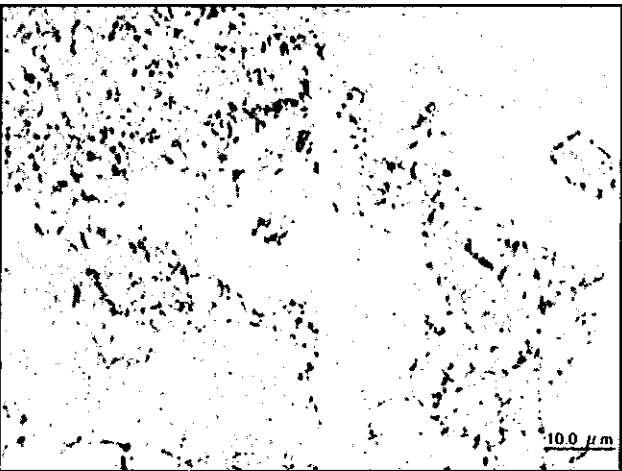
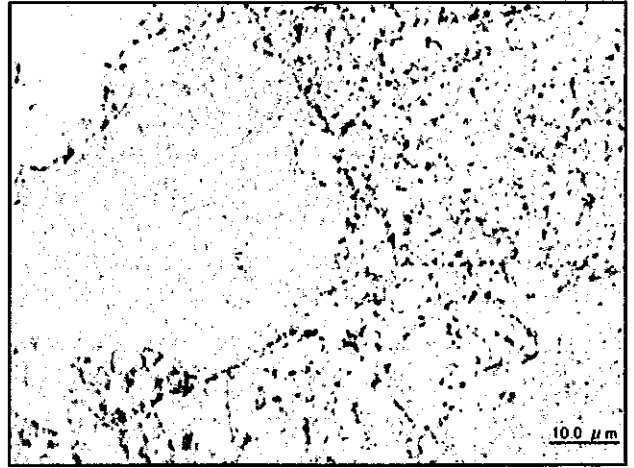
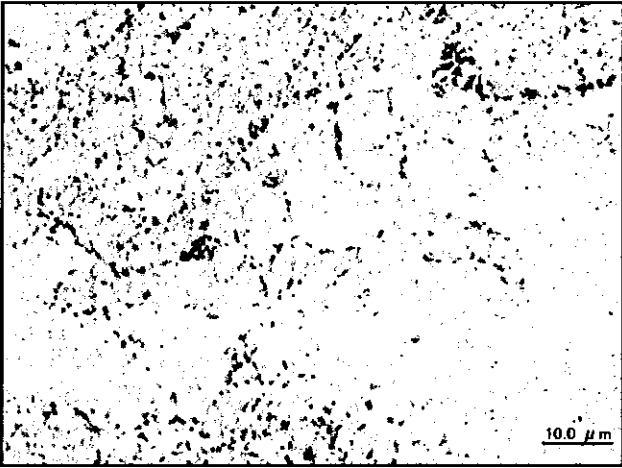
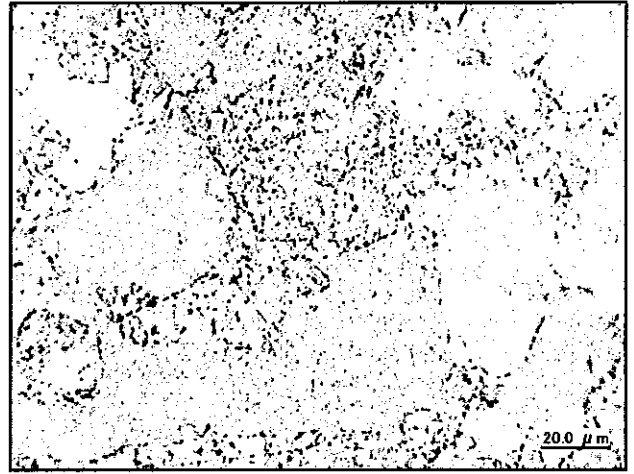
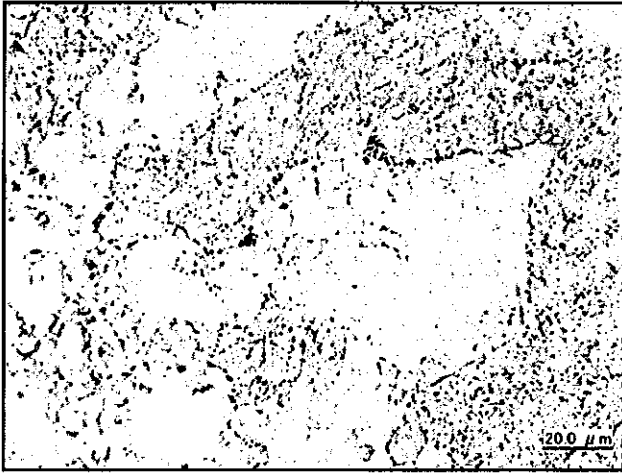
Photo II-4-14 Precipitates by TEM (Transmission electron microscope) observation
Final SH Outlet Header (Circumferential weld at right side : Weld metal)

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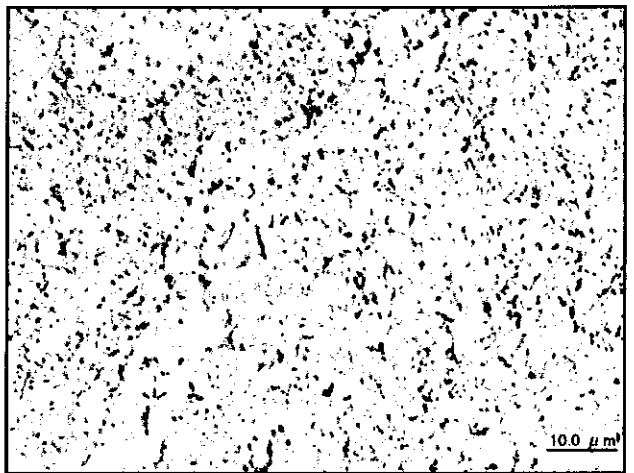
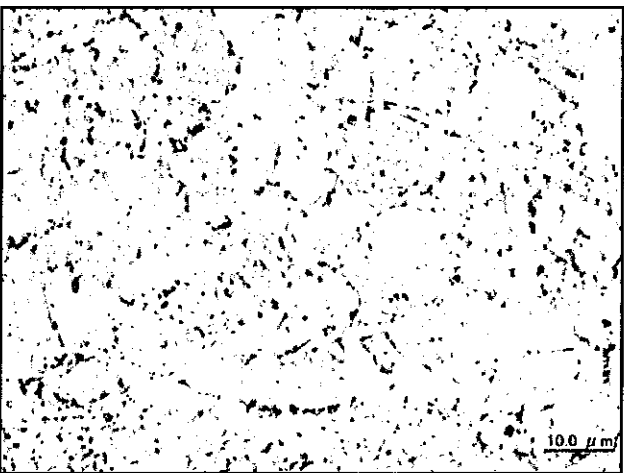
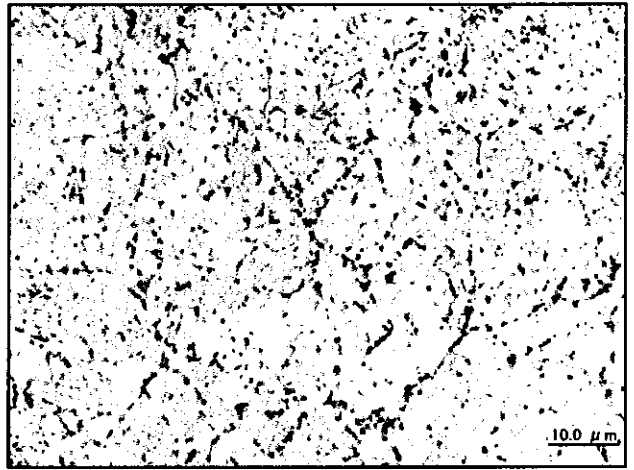
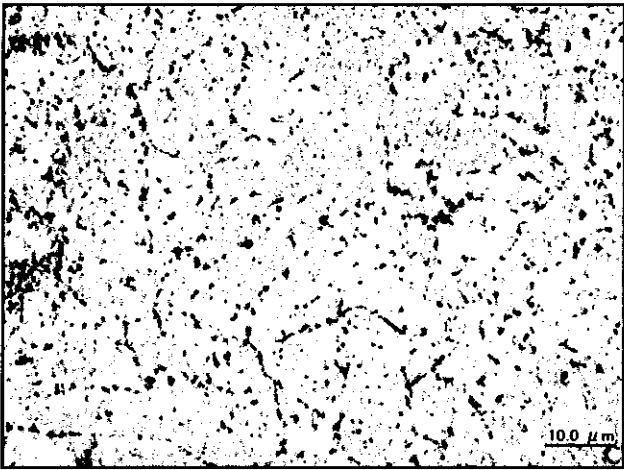
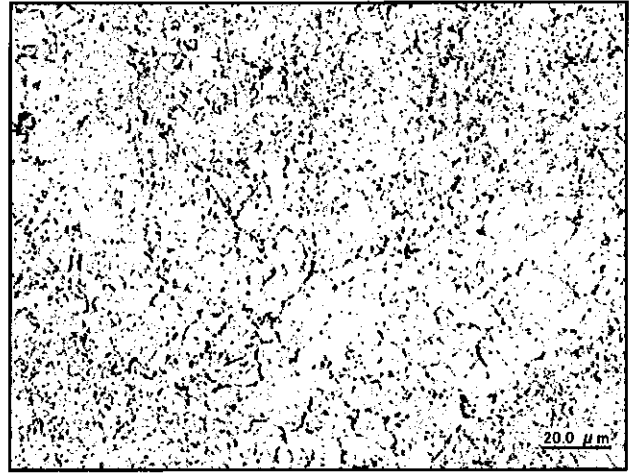
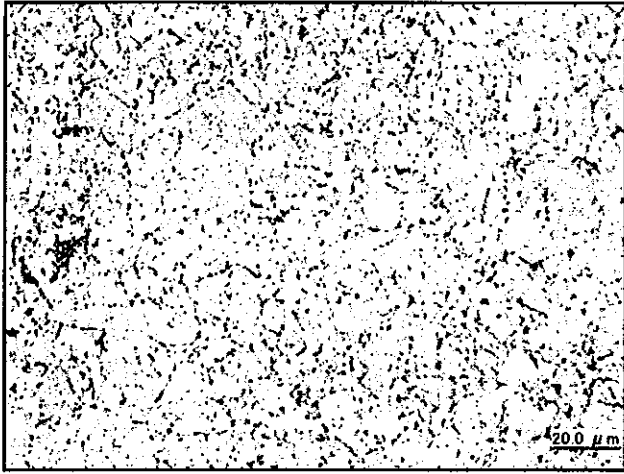
359

Photo II-5-1 Microstructure observation
De-Superheater-Left (Circumferential weld : Base metal)



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Photo II-5-2 Microstructure observation
De-Superheater-Left (Circumferential weld : Intercritical zone)



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Photo II-5-3 Microstructure observation
De-Superheater-Left (Circumferential weld : Fine grain HAZ)

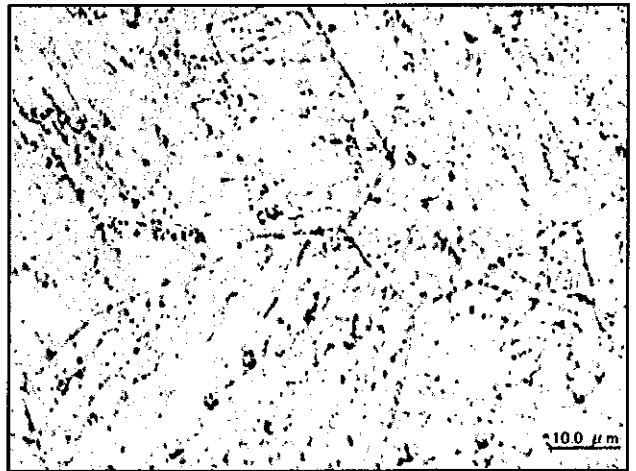
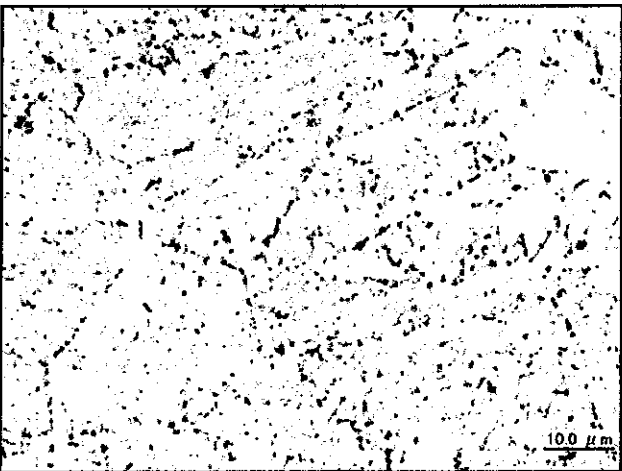
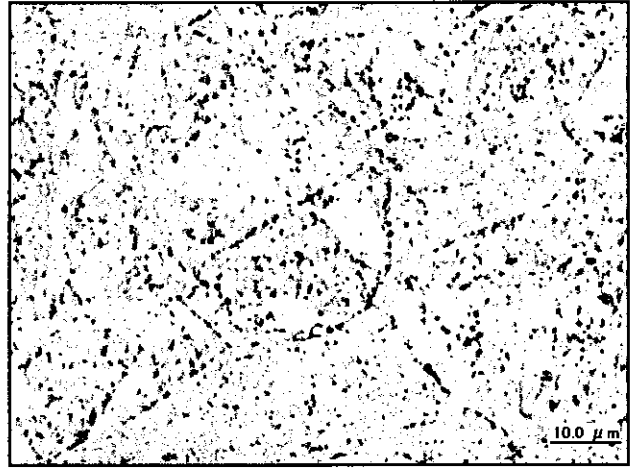
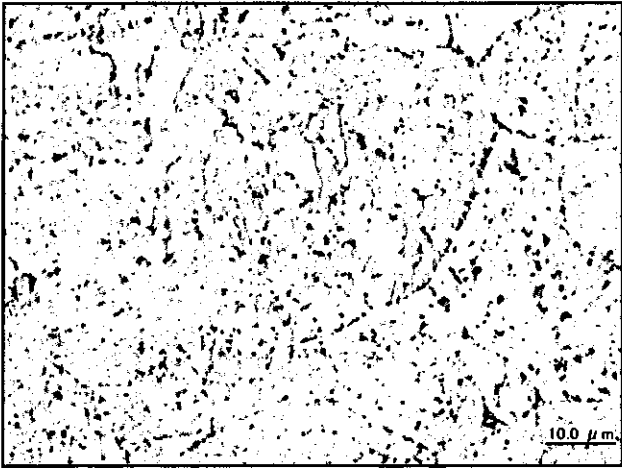
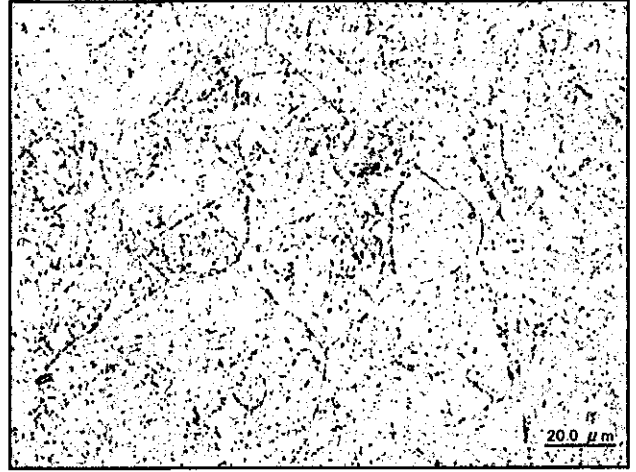
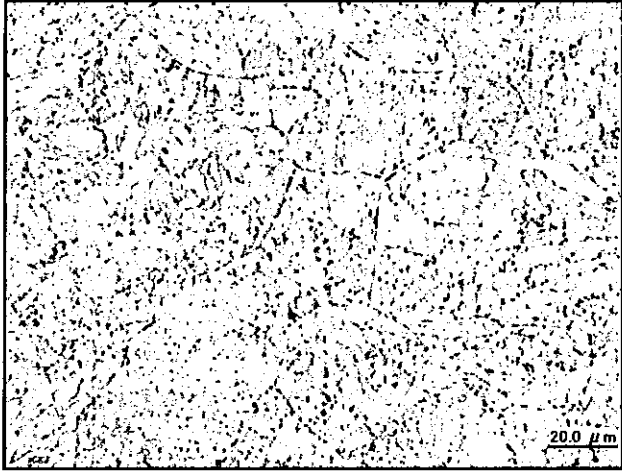
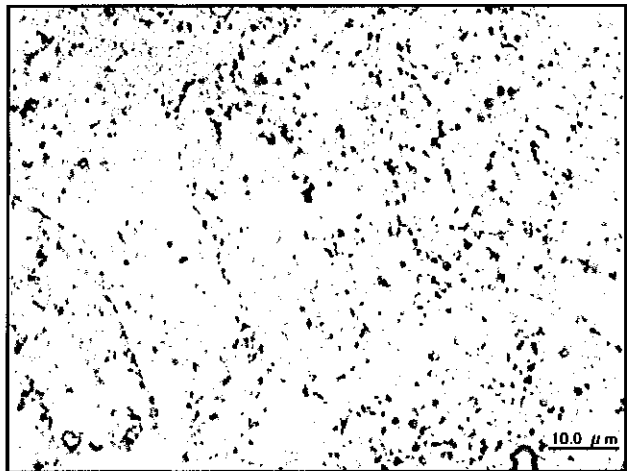
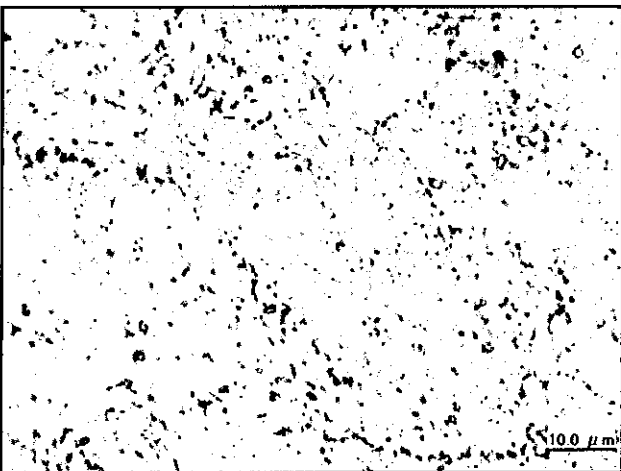
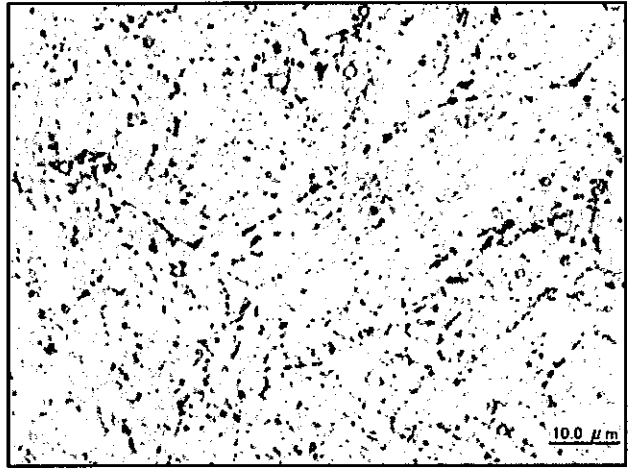
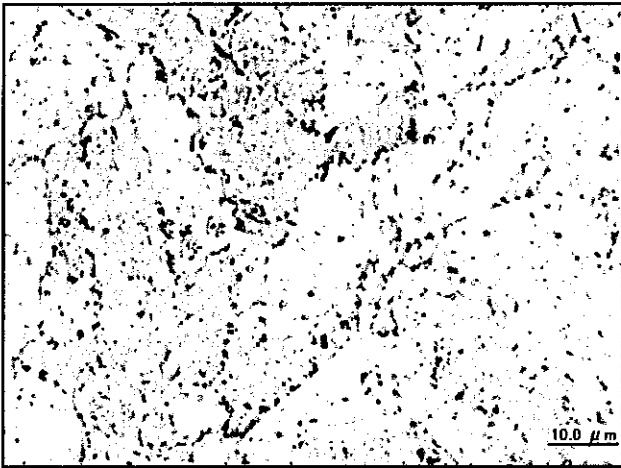
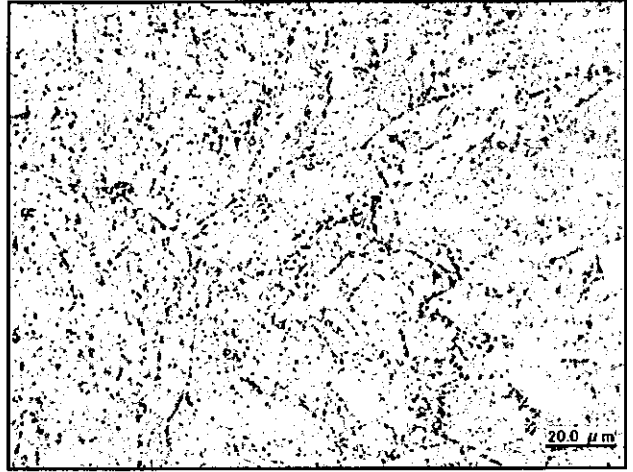
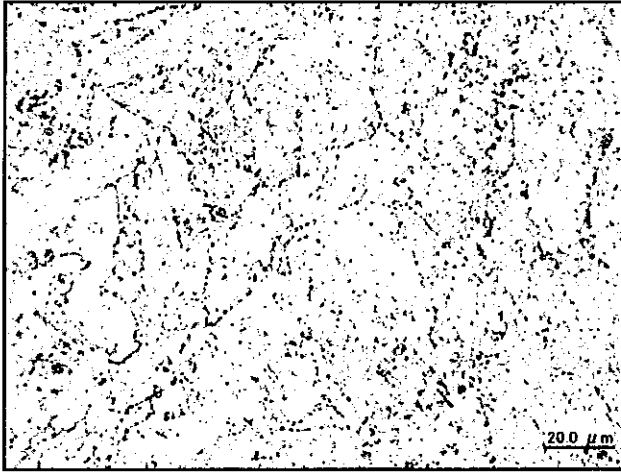


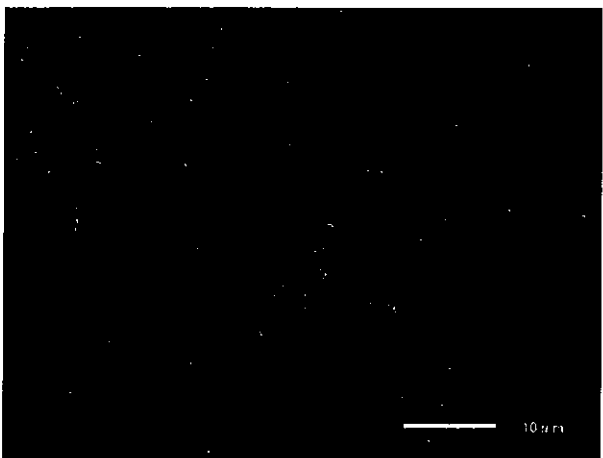
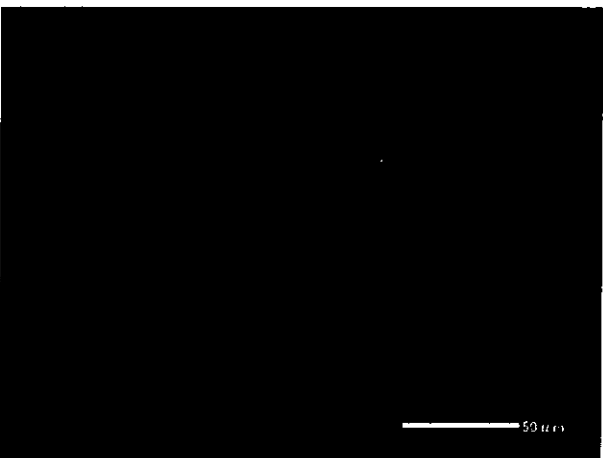
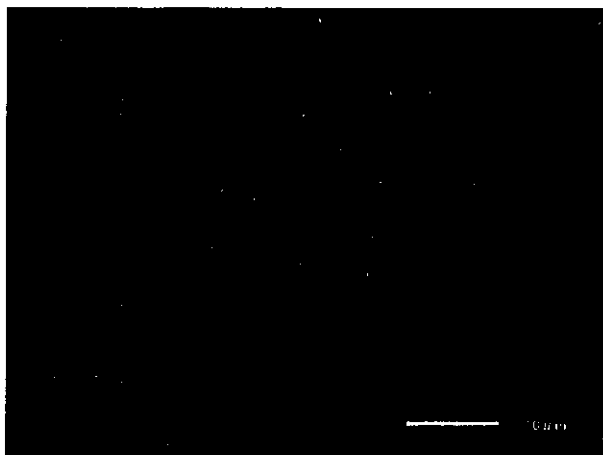
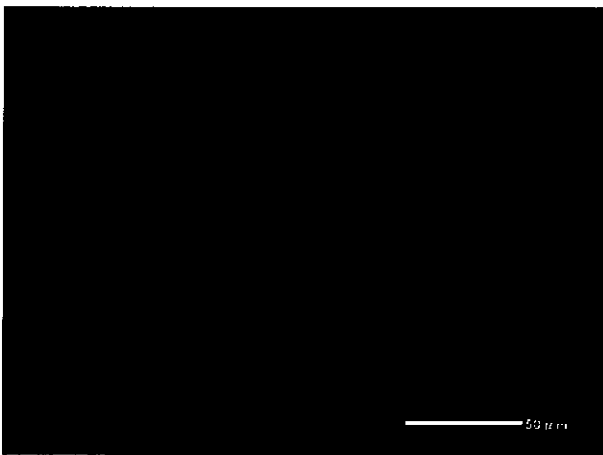
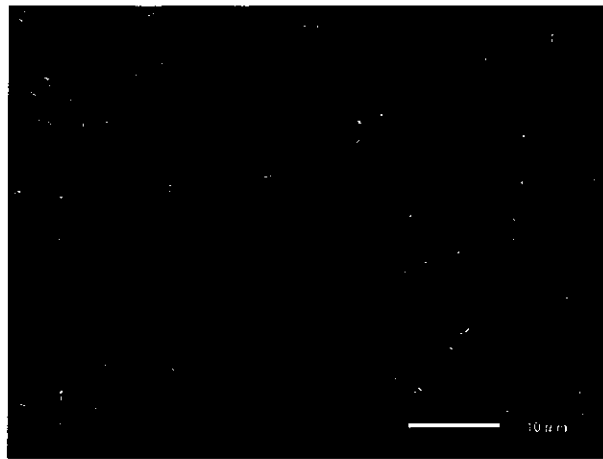
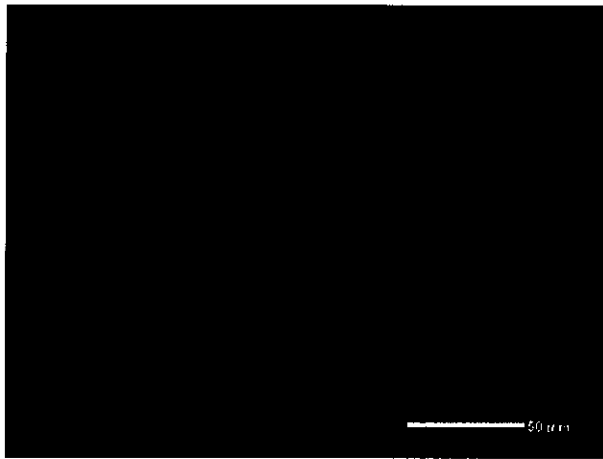
Photo II-5-4 Microstructure observation
De-Superheater-Left (Circumferential weld : Coarse grain HAZ)

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Photo II-5-5 Microstructure observation
De-Superheater-Left (Circumferential weld : Weld metal)



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Photo II-5-6 SEM (Scanning electron microscope) observation
De-Superheater-Left (Circumferential weld : Fine grain HAZ)

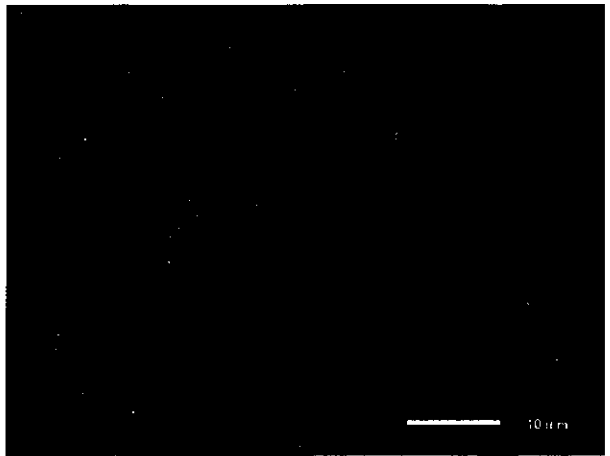
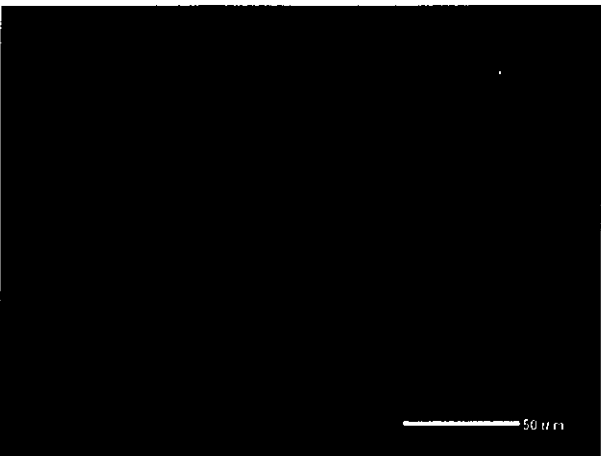
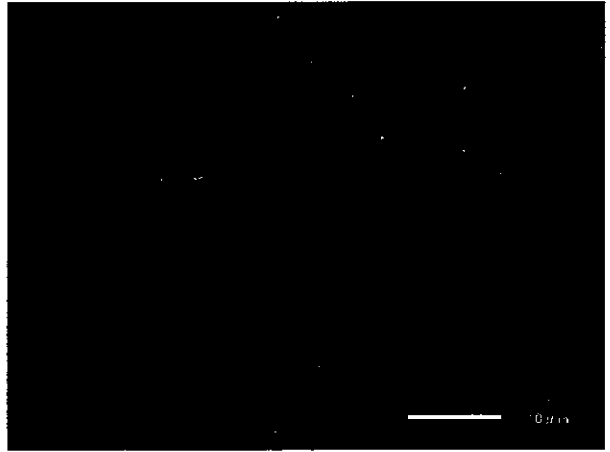
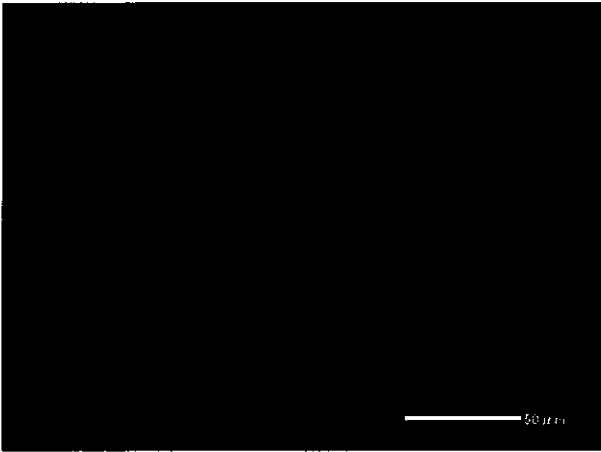
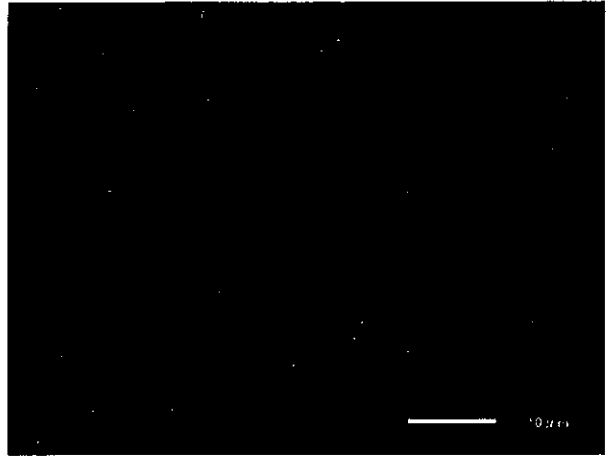
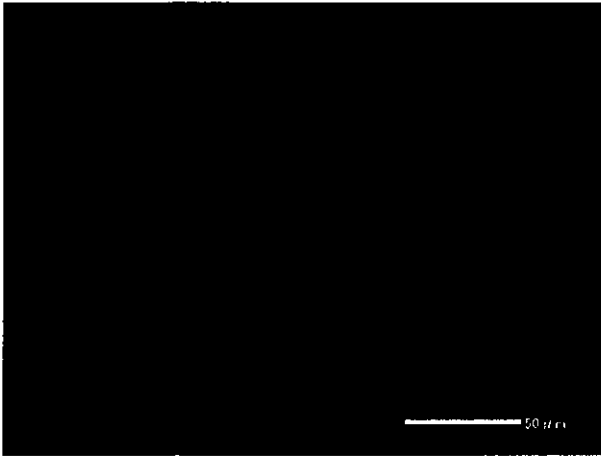


Photo II-5-7 SEM(Scanning electron microscope) observation
De-Superheater-Left(Circumferential weld : Coarse grain HAZ)

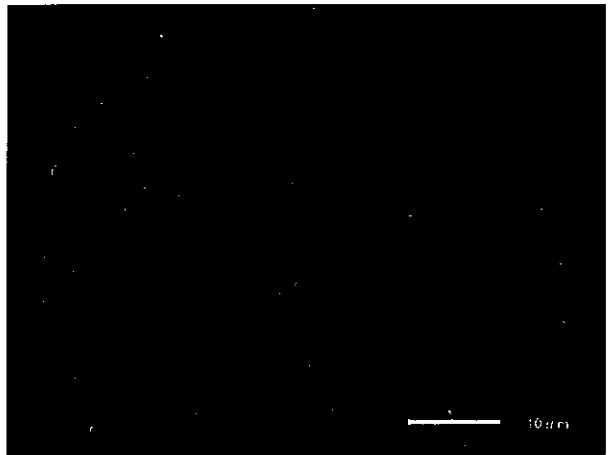
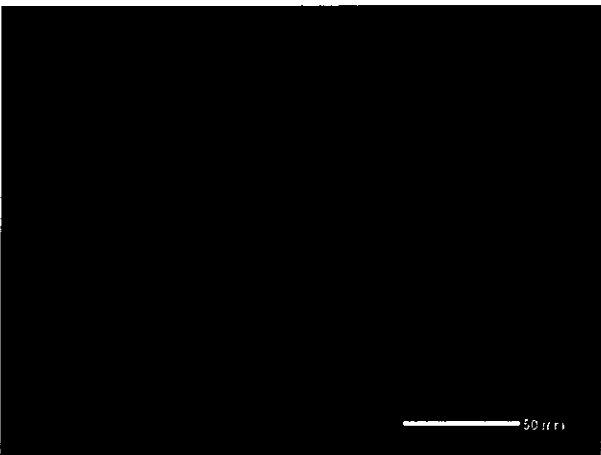
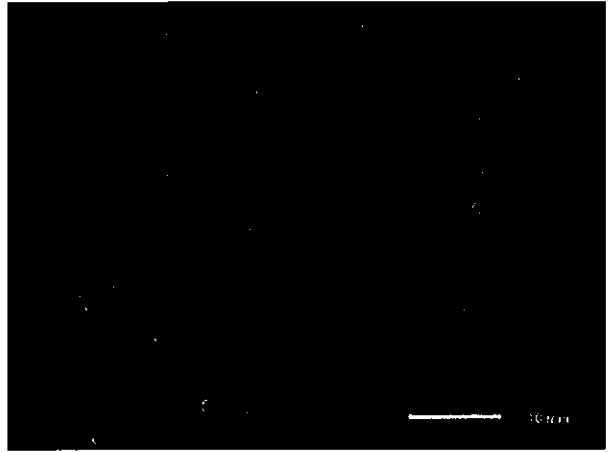
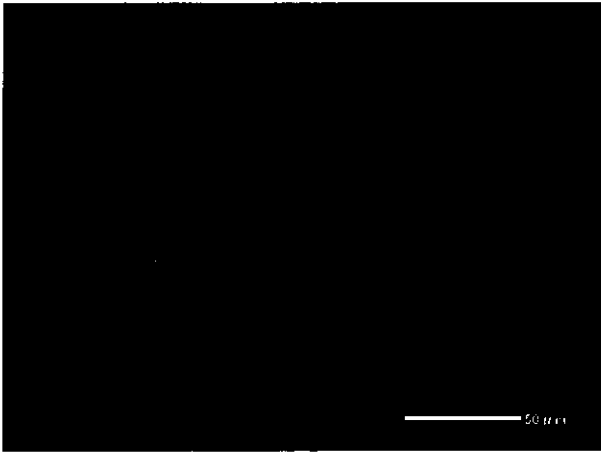
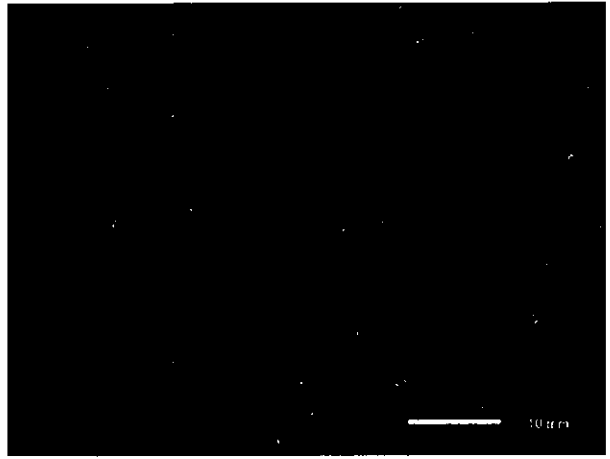


Photo II-5-8 SEM(Scanning electron microscope) observation
De-Superheater-Left(Circumferential weld : Weld metal)

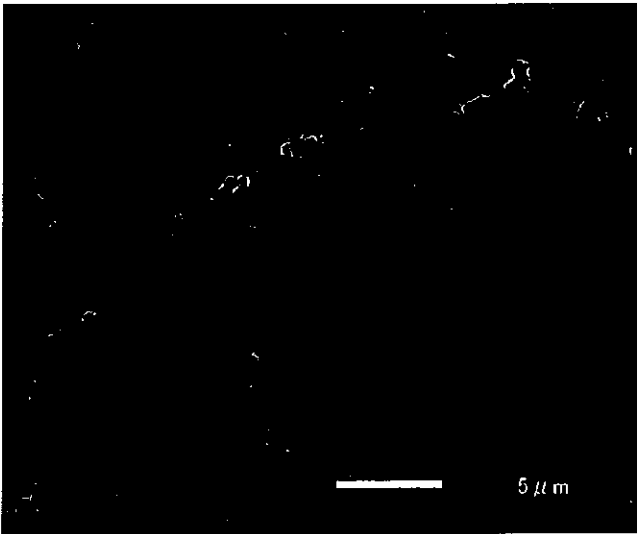
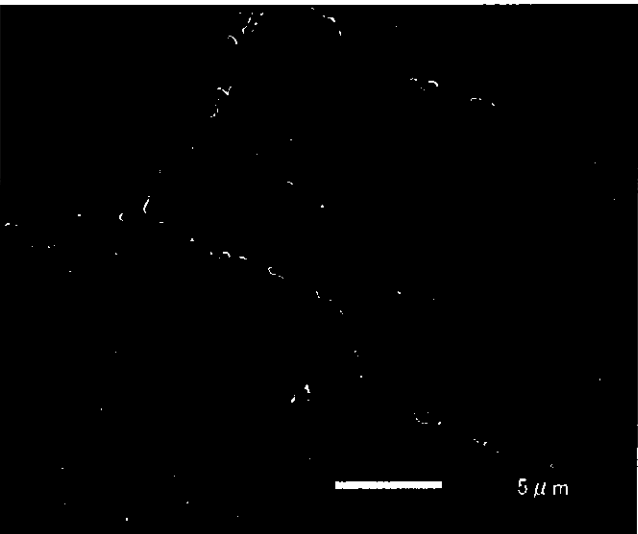
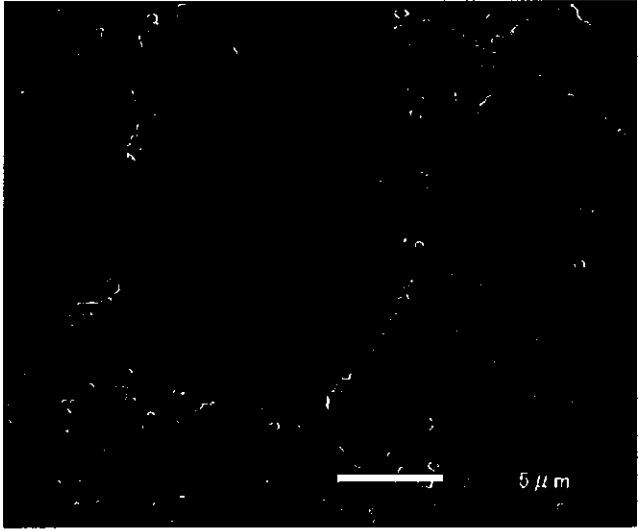
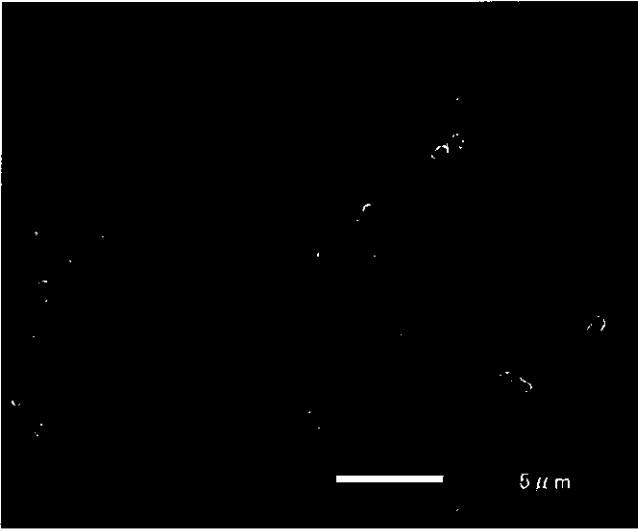
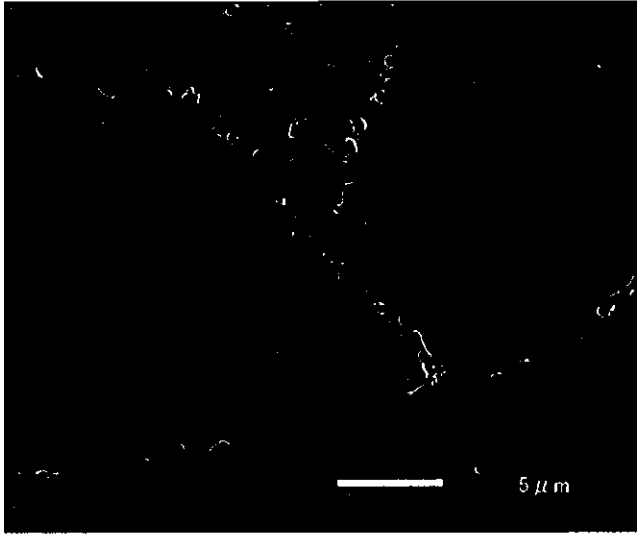
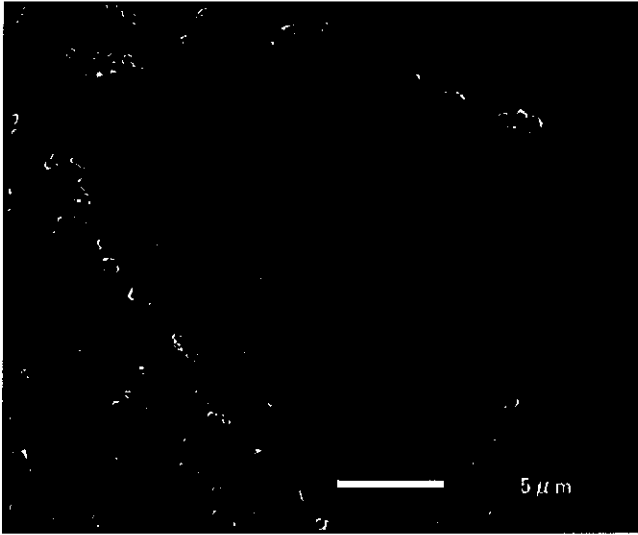


Photo II-5-9 Precipitates along grain boundary by SEM observation
De-Superheater-Left (Circumferential weld : Base metal)

265

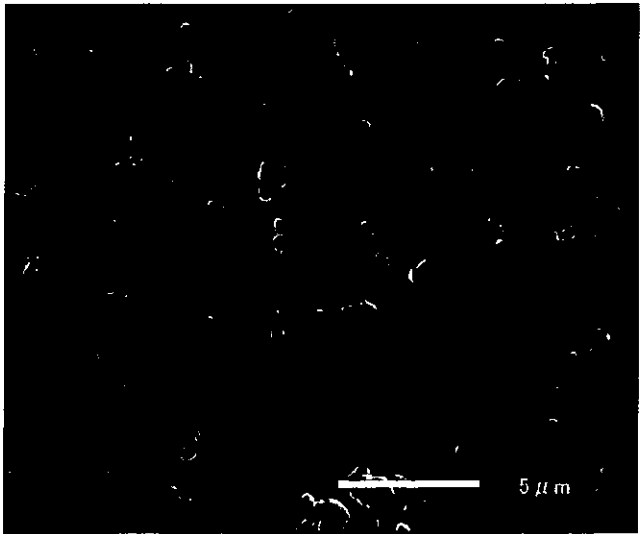
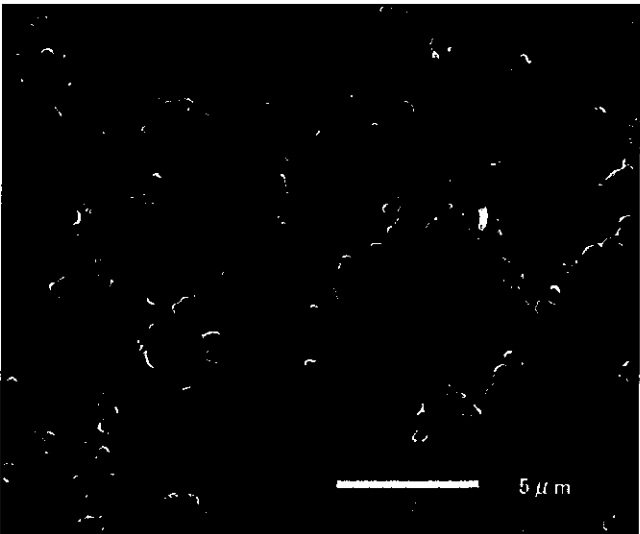
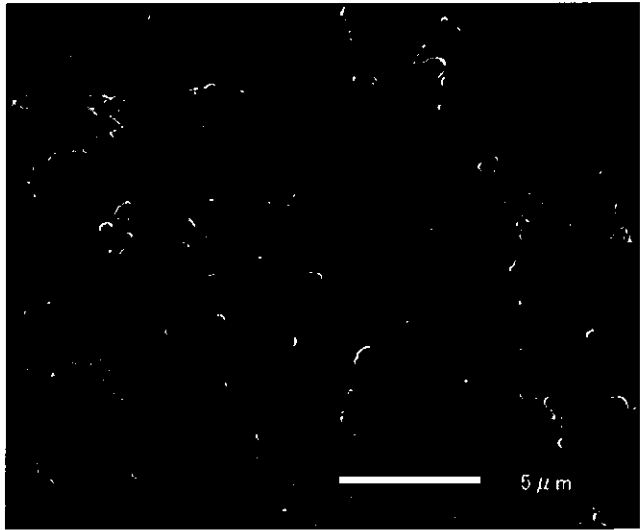
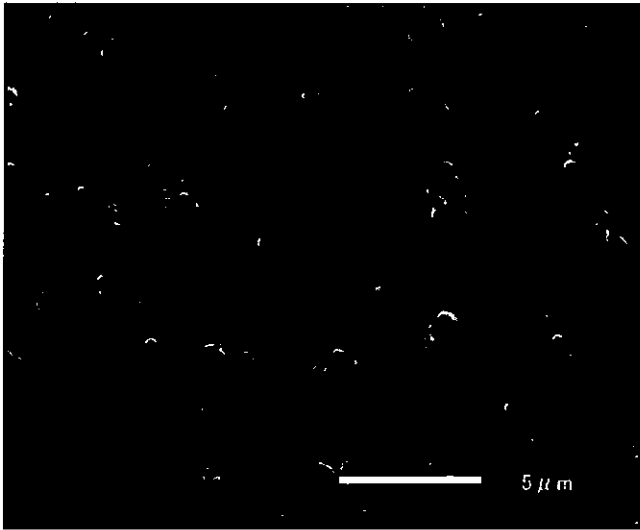
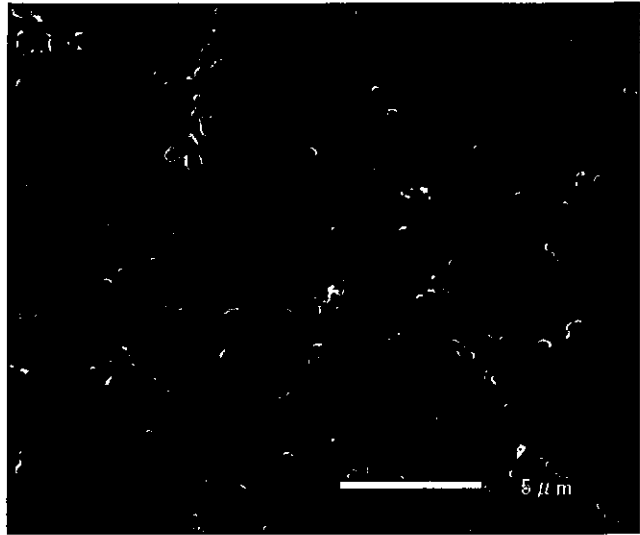
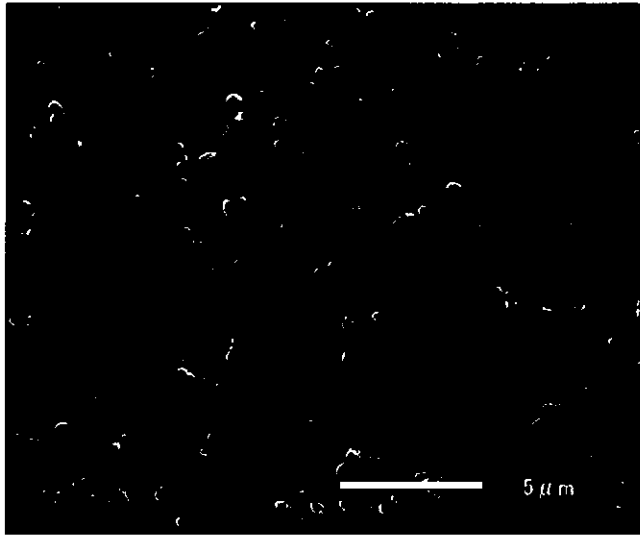
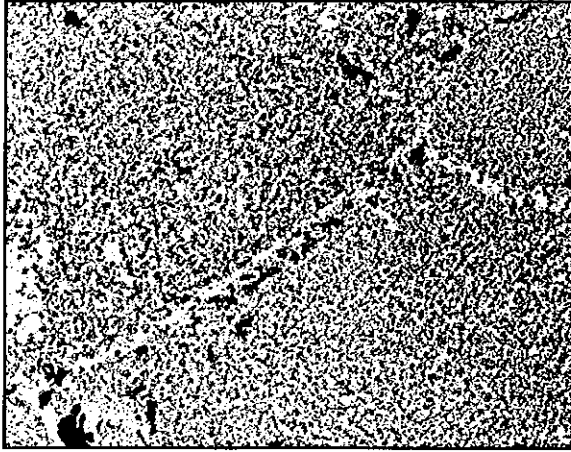
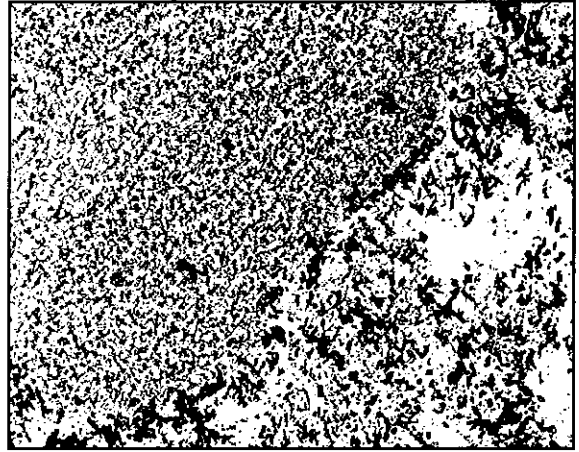


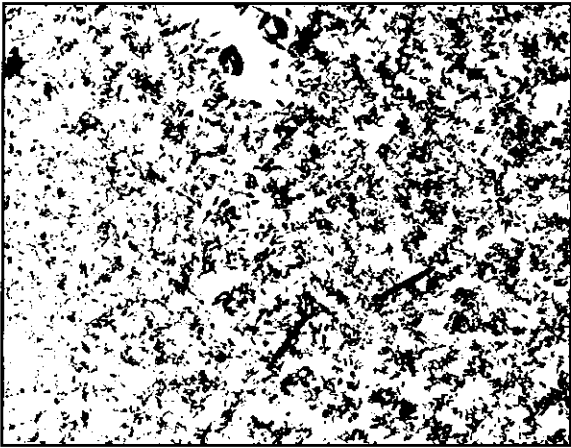
Photo II-5-10 Precipitates along grain boundary by SEM observation
De-Superheater-Left (Circumferential weld : Fine grain HAZ)



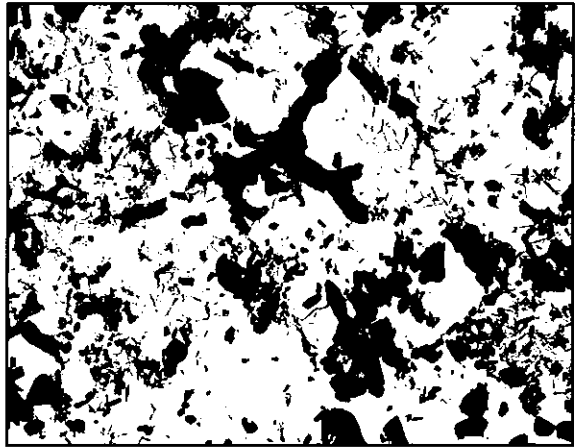
5 μ m



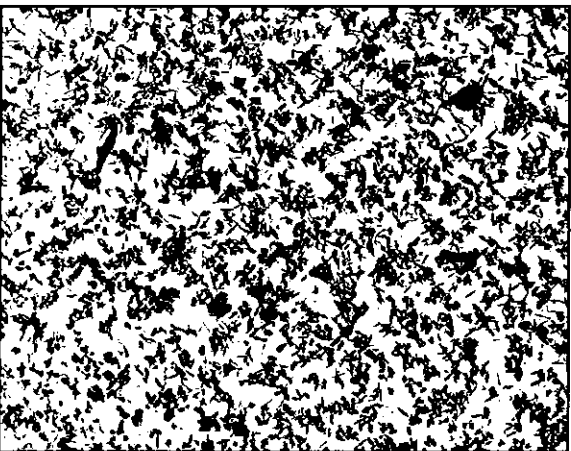
5 μ m



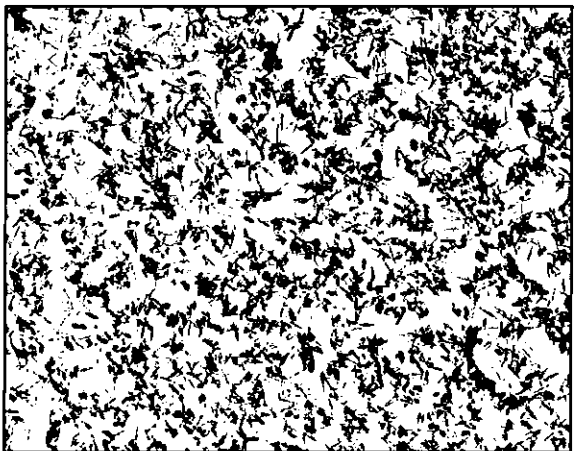
1 μ m



1 μ m

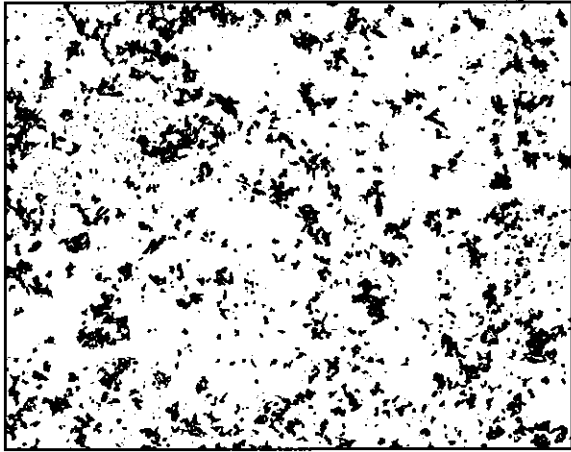


1 μ m

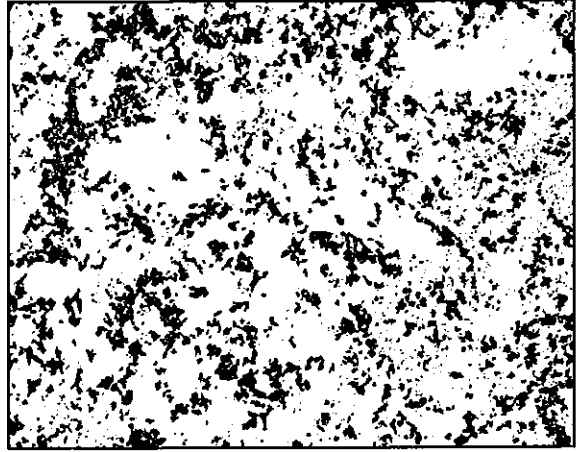


1 μ m

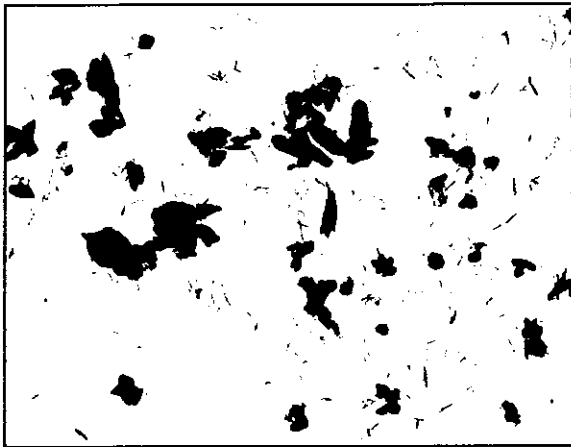
Photo II-5-11 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Left (Circumferential weld : Base metal)



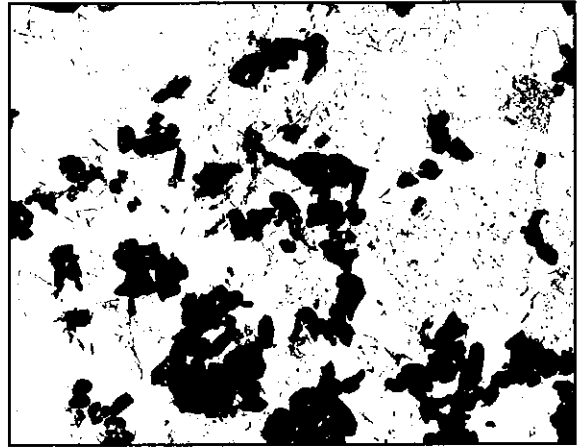
5 μ m



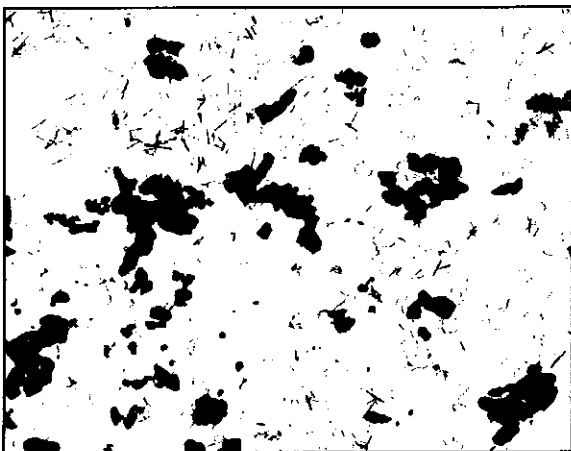
5 μ m



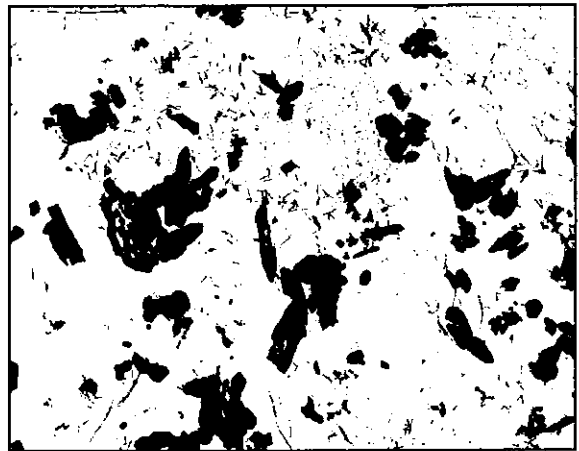
1 μ m



1 μ m

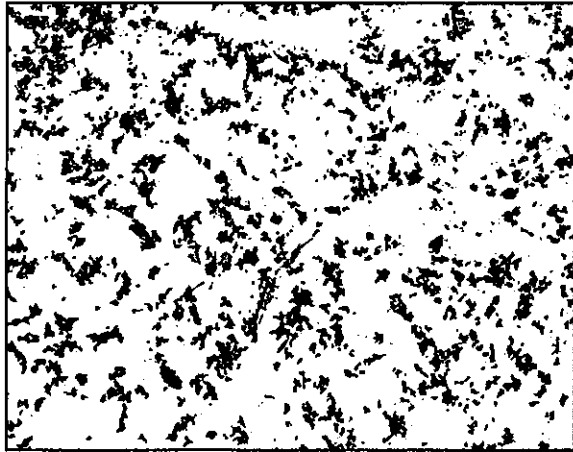


1 μ m

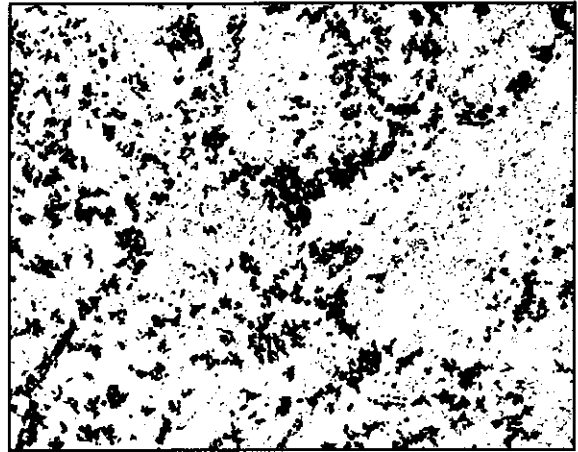


1 μ m

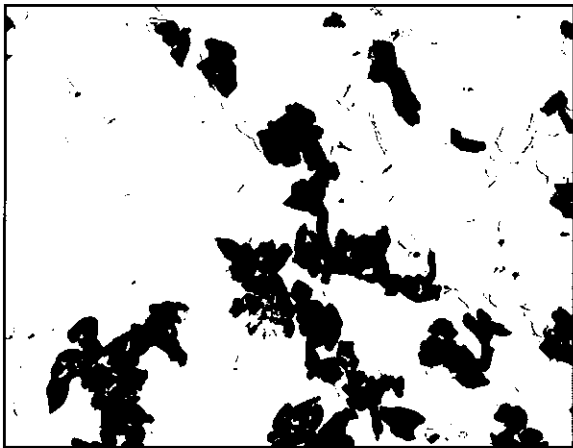
Photo II-5-12 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Left (Circumferential weld : Fine grain HAZ)



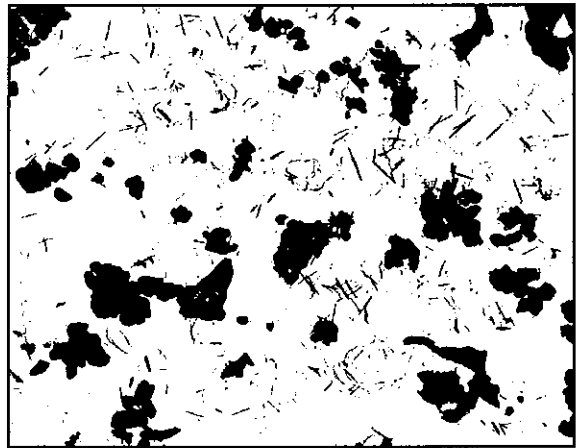
5 μ m



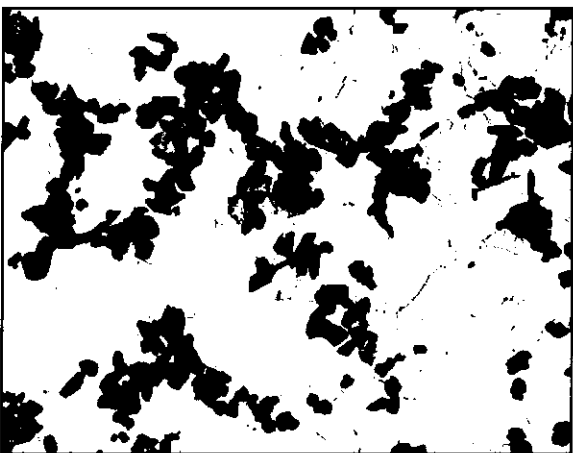
5 μ m



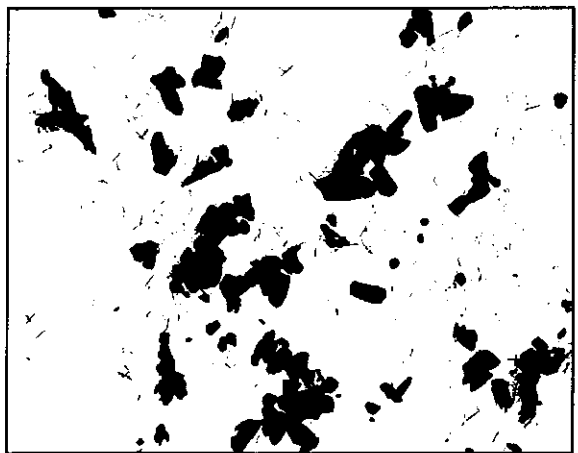
1 μ m



1 μ m



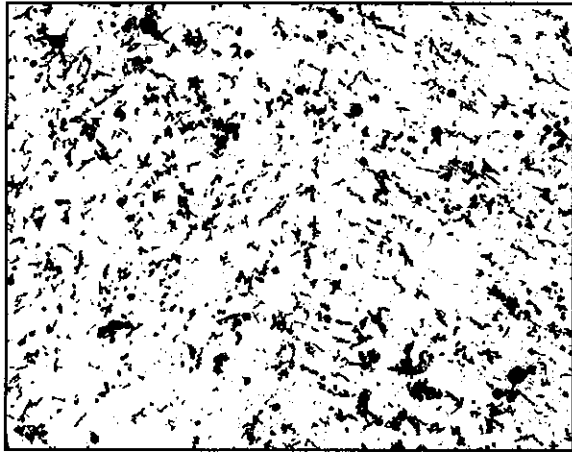
1 μ m



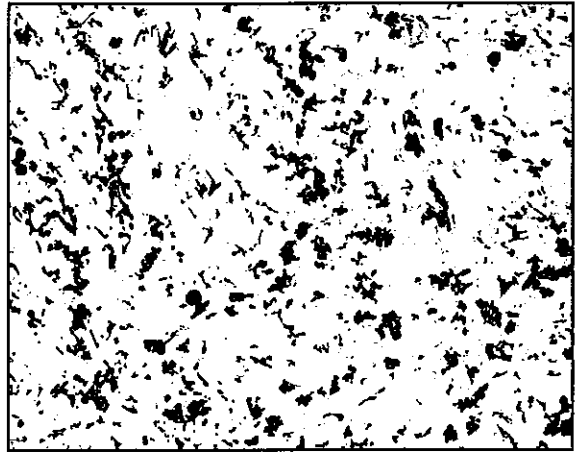
1 μ m

391

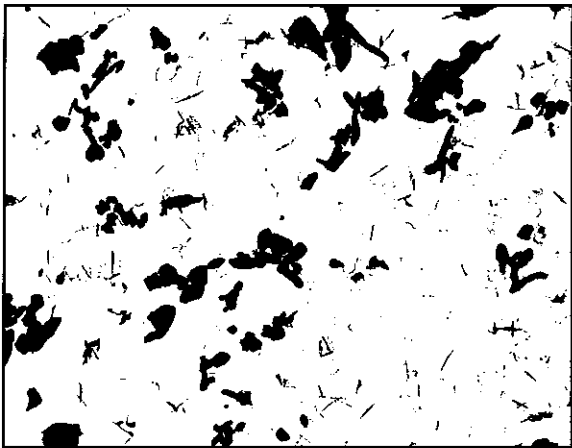
Photo II-5-13 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Left (Circumferential weld : Coarse grain HAZ)



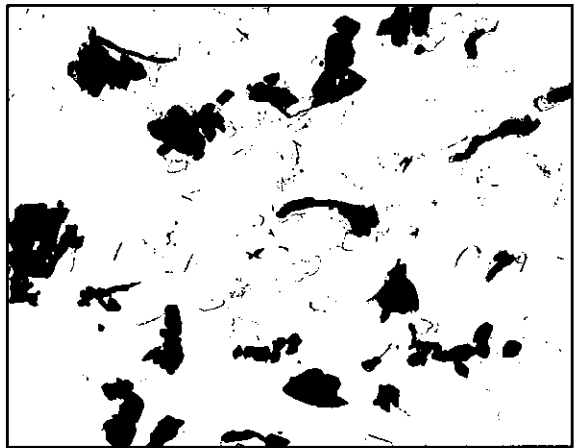
5 μ m



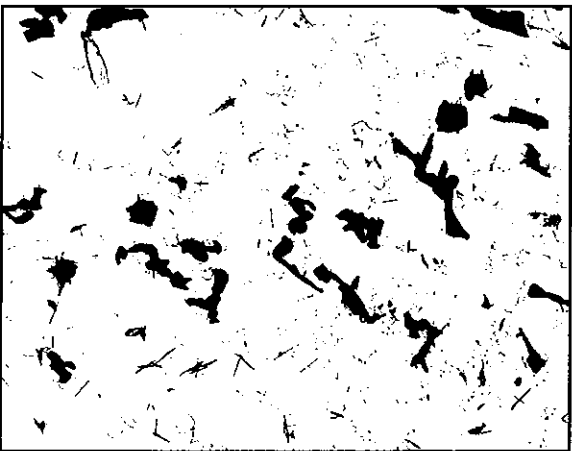
5 μ m



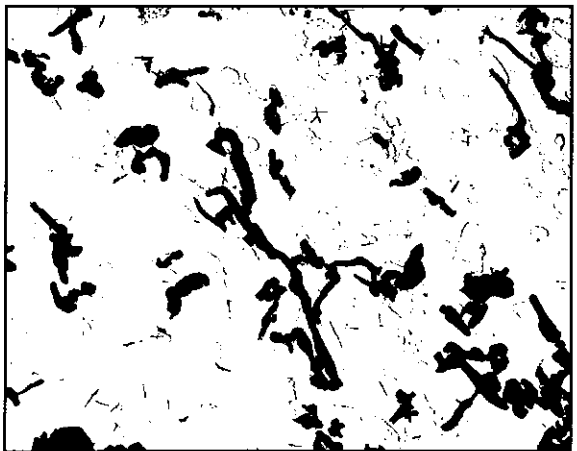
1 μ m



1 μ m



1 μ m



1 μ m

Photo II-5-14 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Left (Circumferential weld : Weld metal)

352

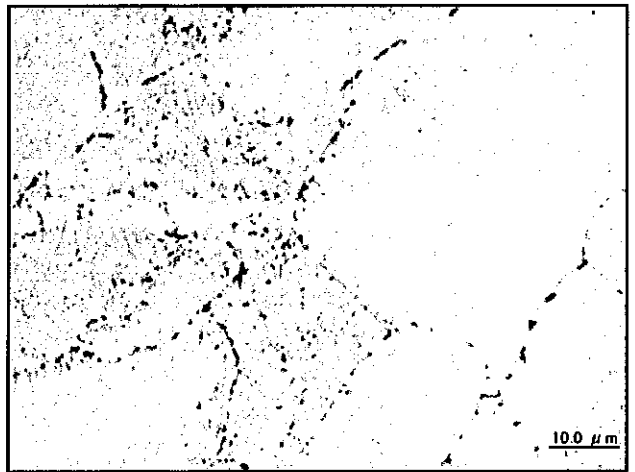
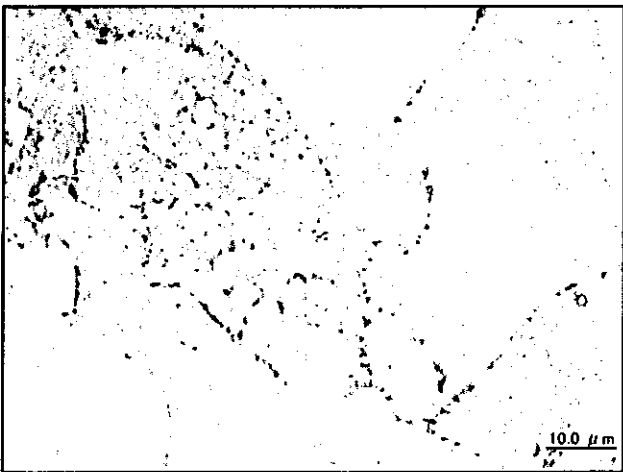
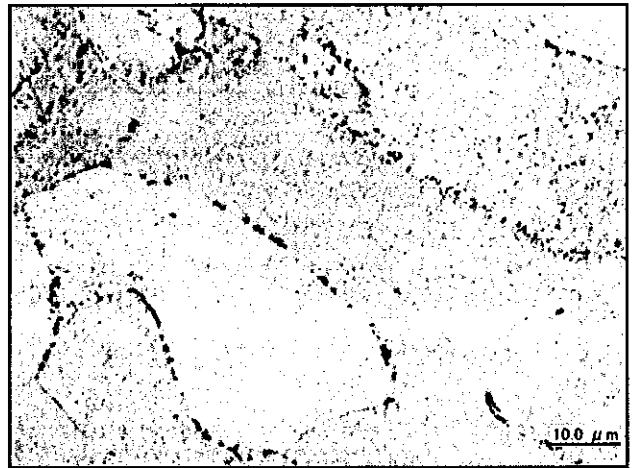
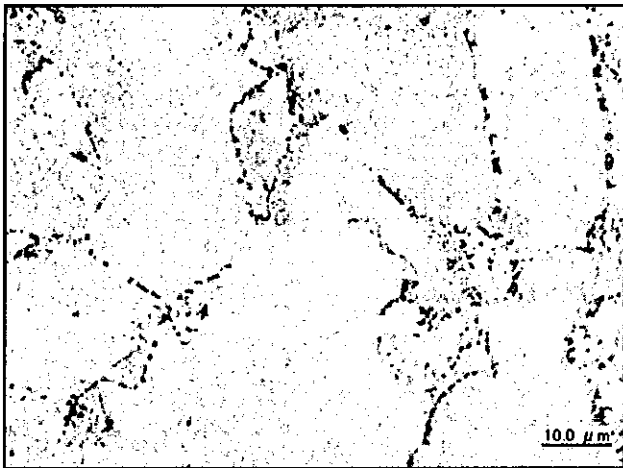
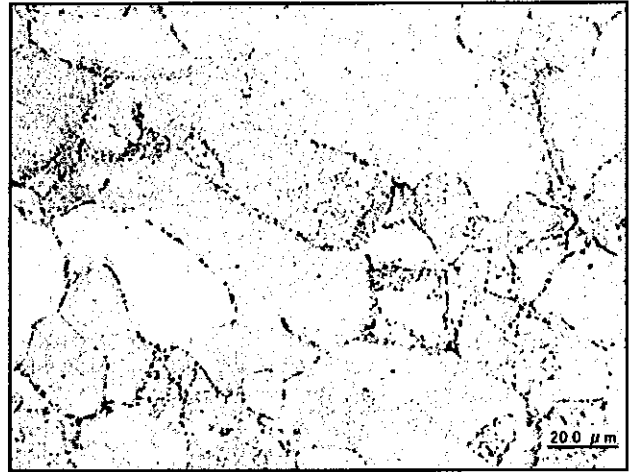
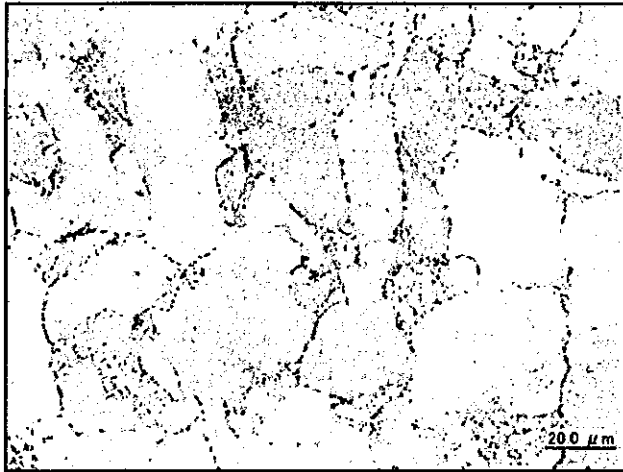


Photo II-6-1 Microstructure observation
De-Superheater-Right (Circumferential weld : Base metal)

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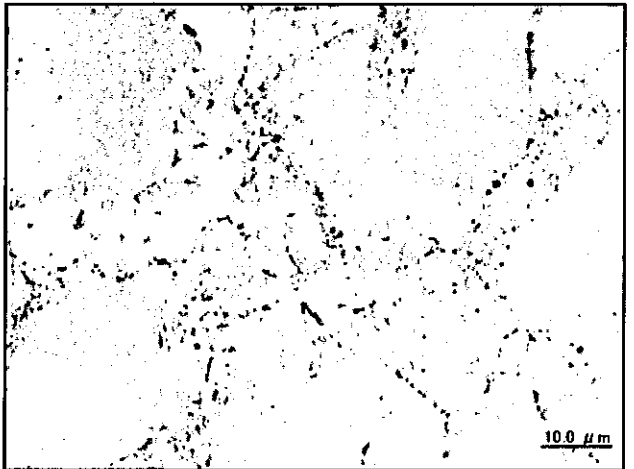
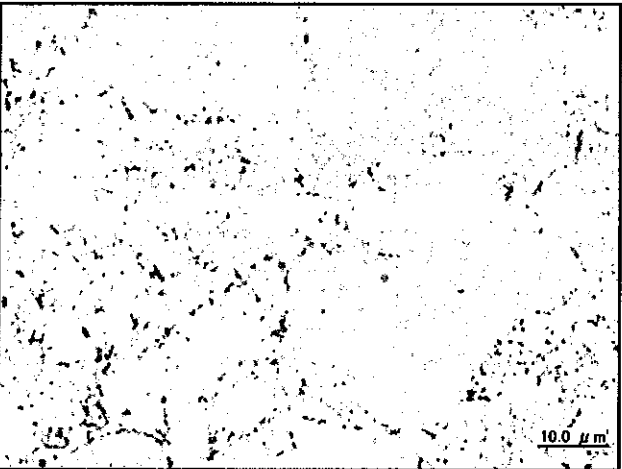
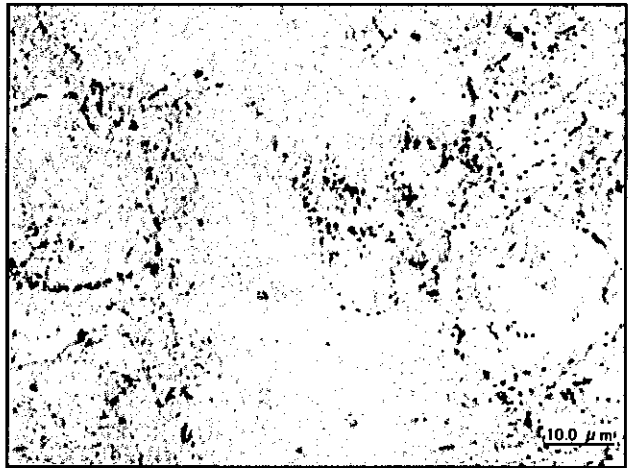
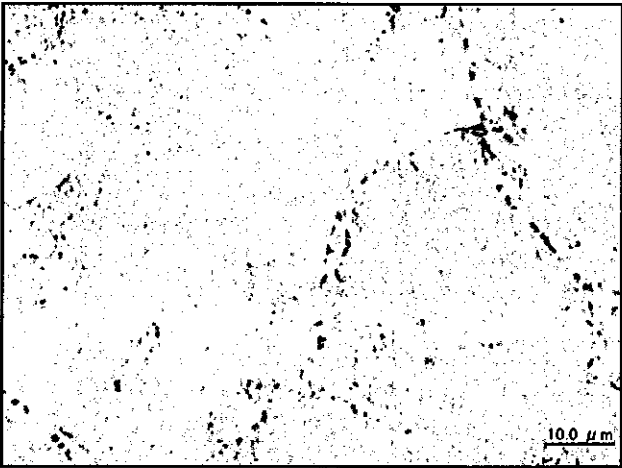
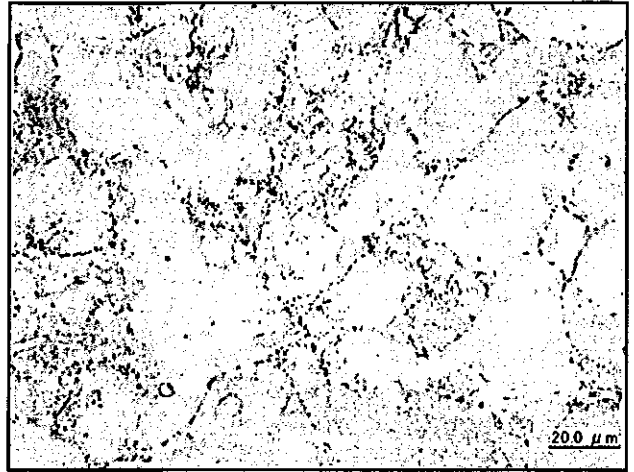
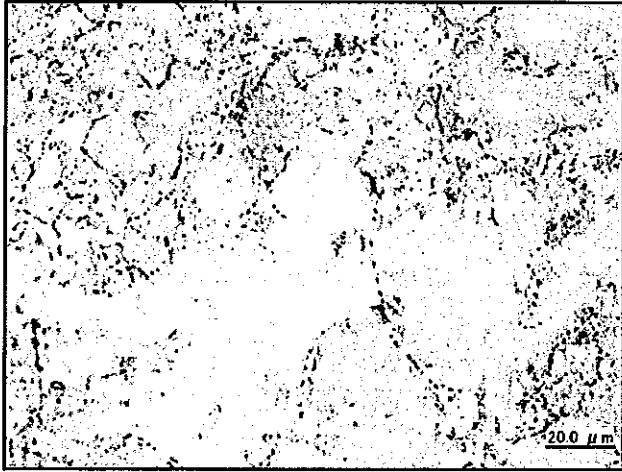
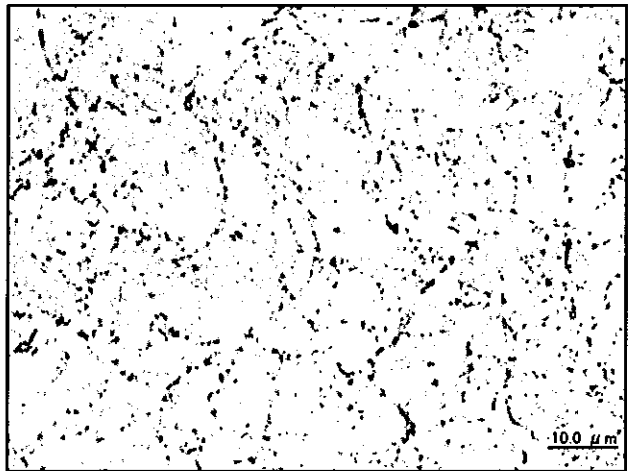
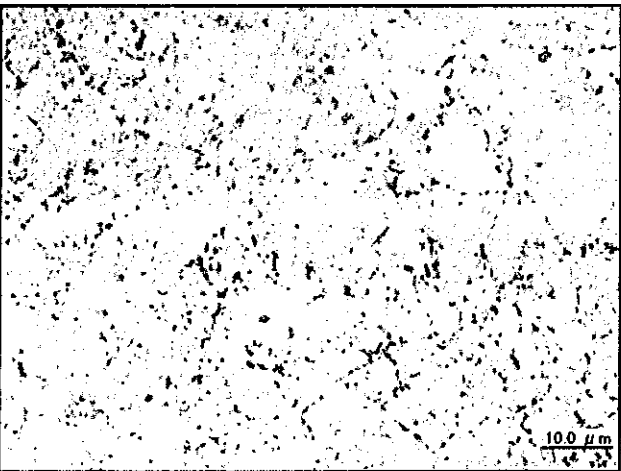
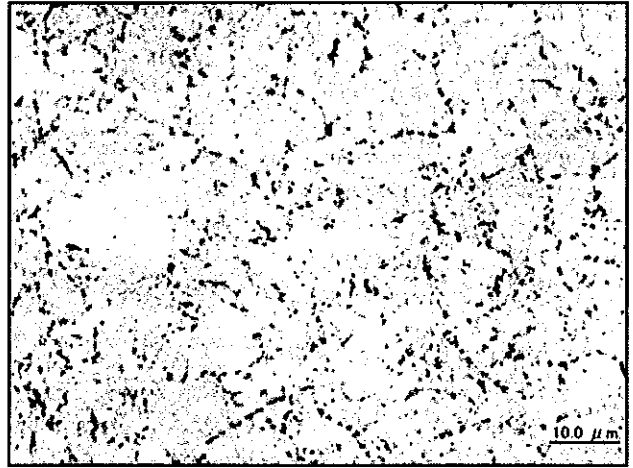
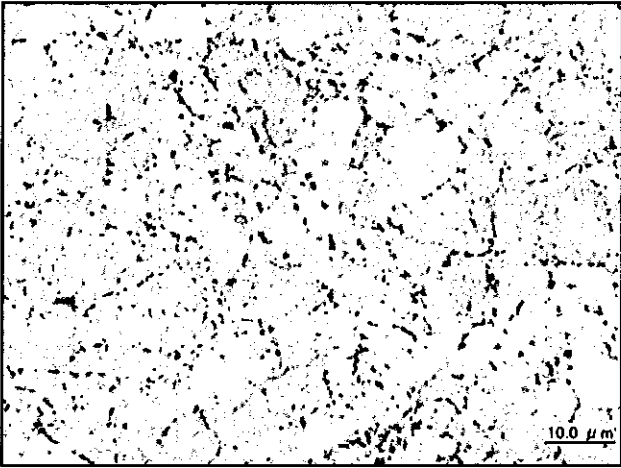
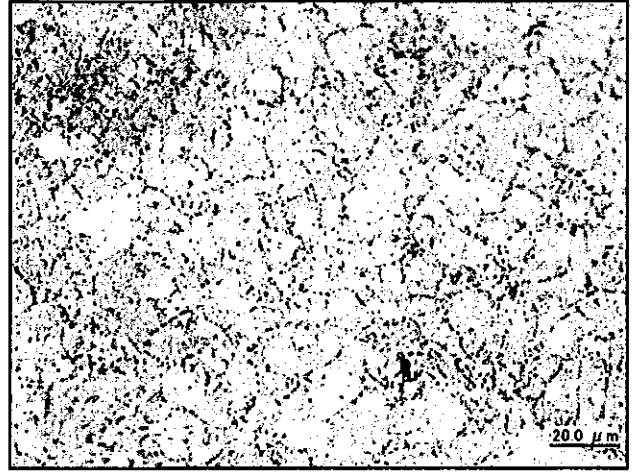
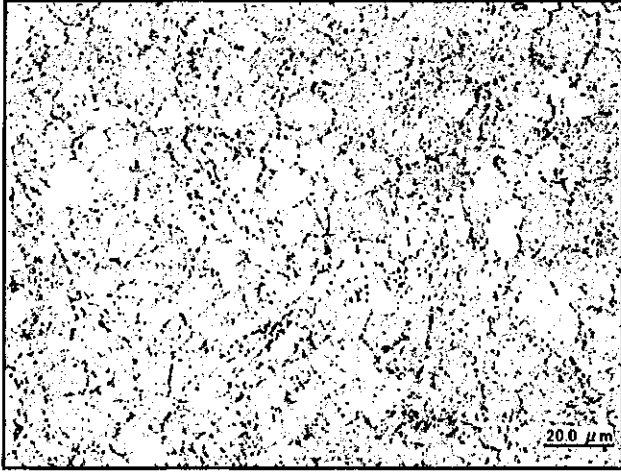


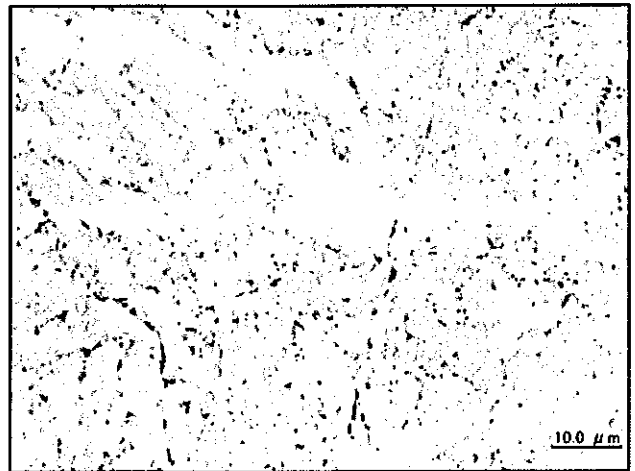
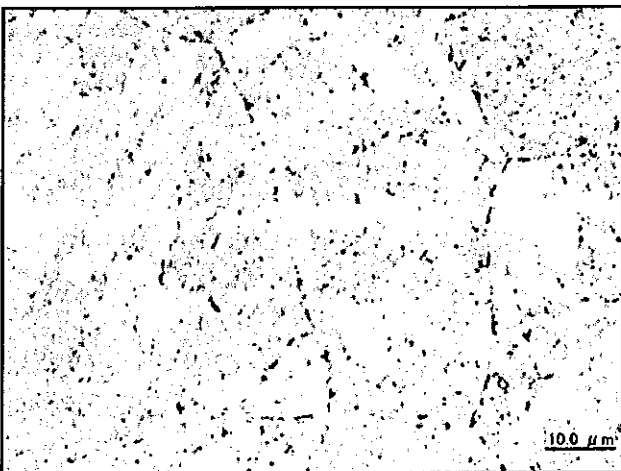
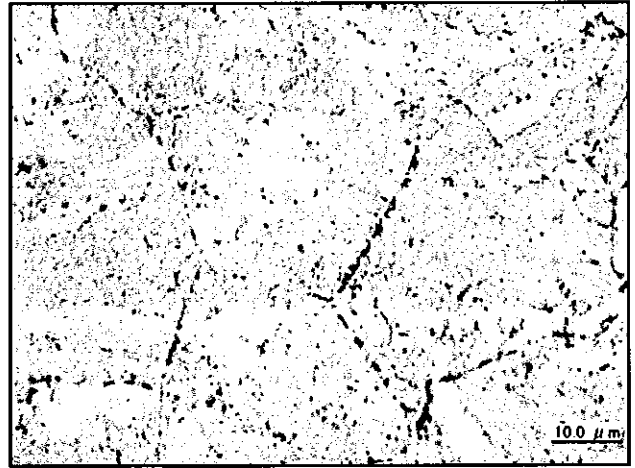
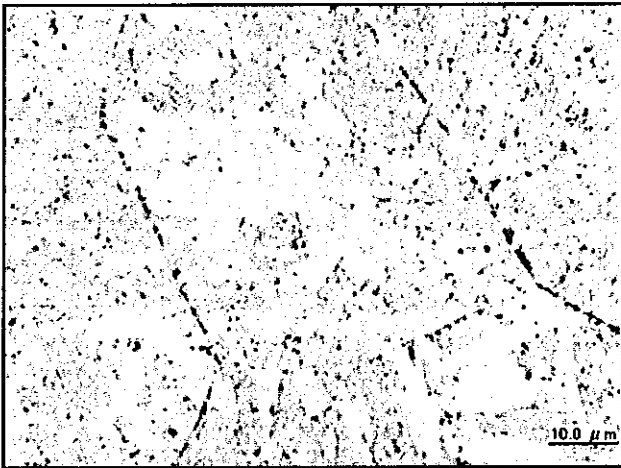
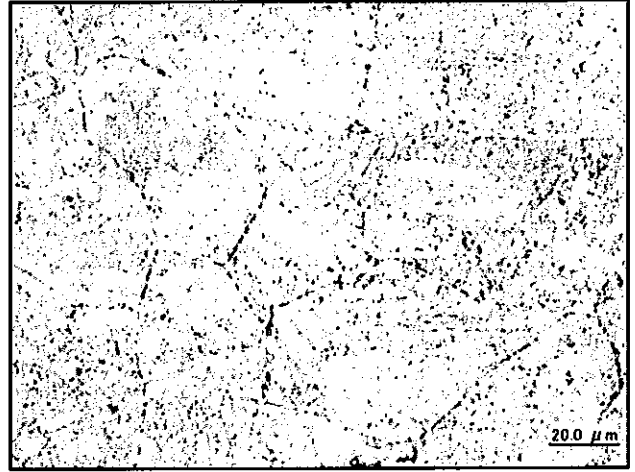
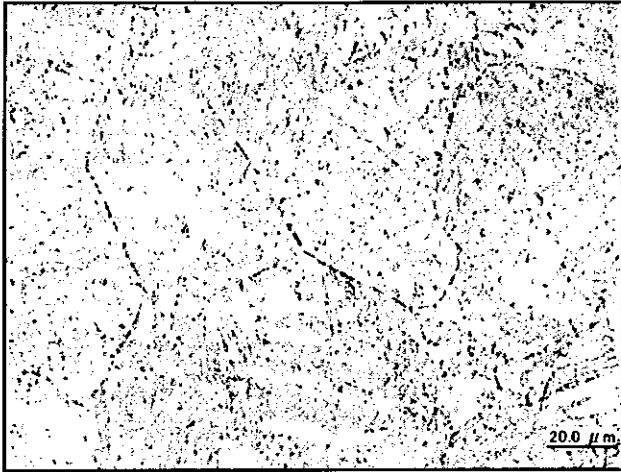
Photo II-6-2 Microstructure observation
De-Superheater-Right (Circumferential weld : Intercritical zone)

50



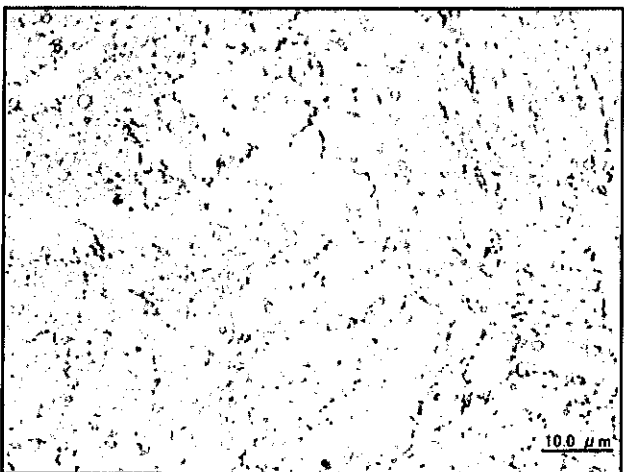
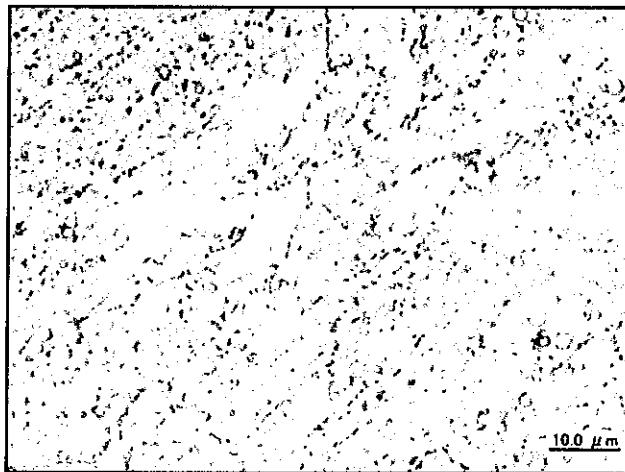
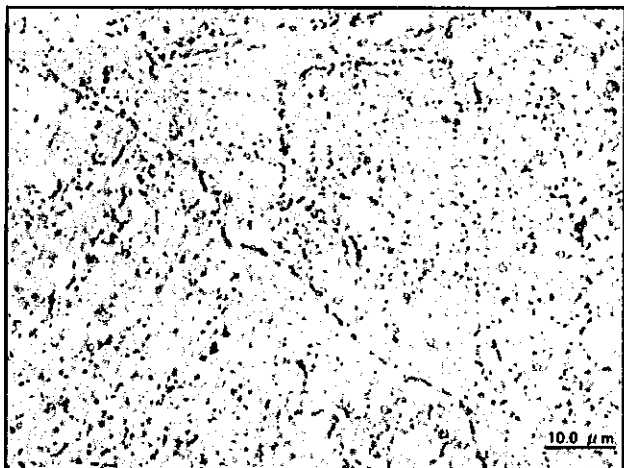
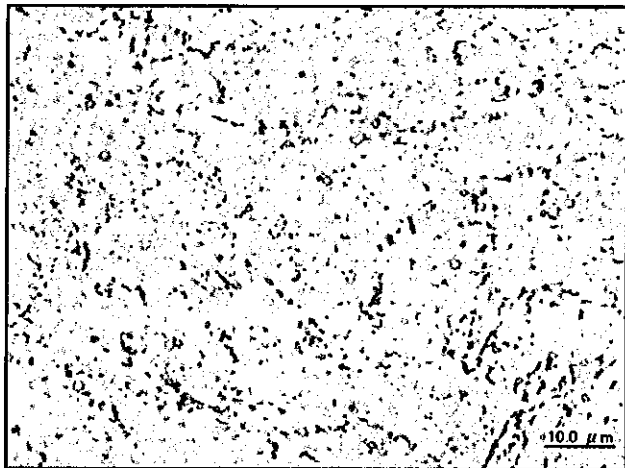
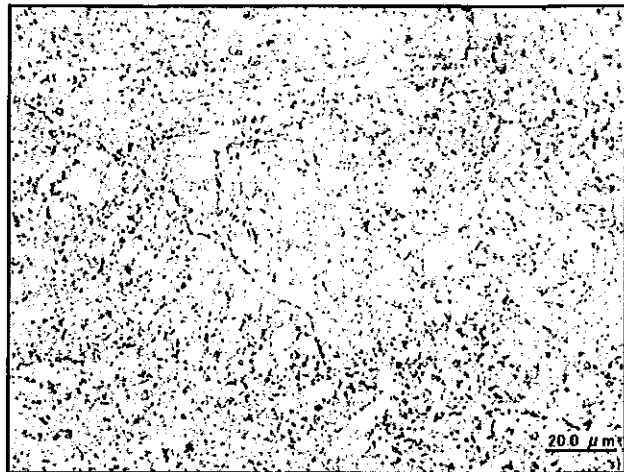
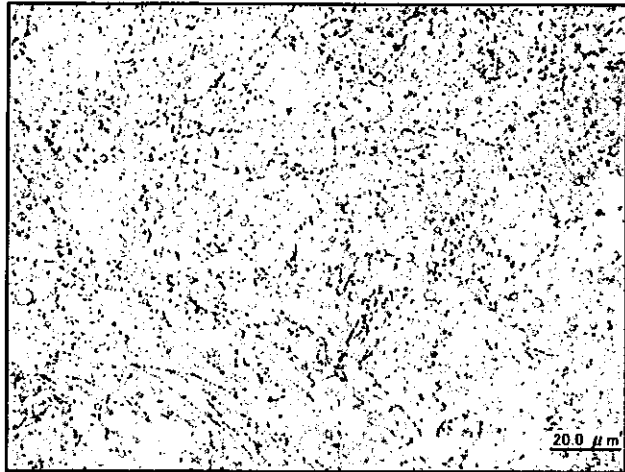
395

Photo II-6-3 Microstructure observation
De-Superheater-Right (Circumferential weld : Fine grain HAZ)



596

Photo II-6-4 Microstructure observation
De-Superheater-Right (Circumferential weld : Coarse grain HAZ)



66E

Photo II-6-5 Microstructure observation
De-Superheater-Right (Circumferential weld : Weld metal)

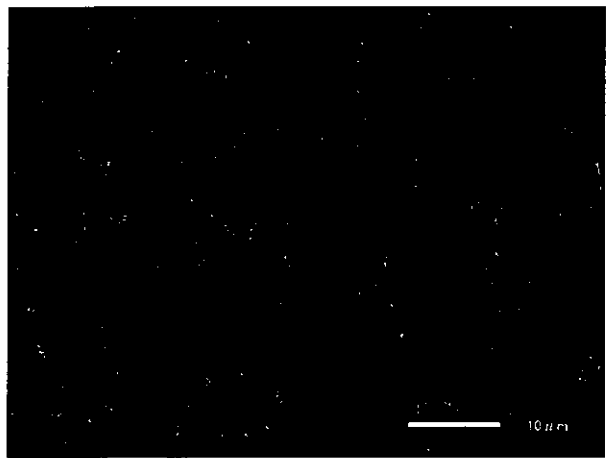
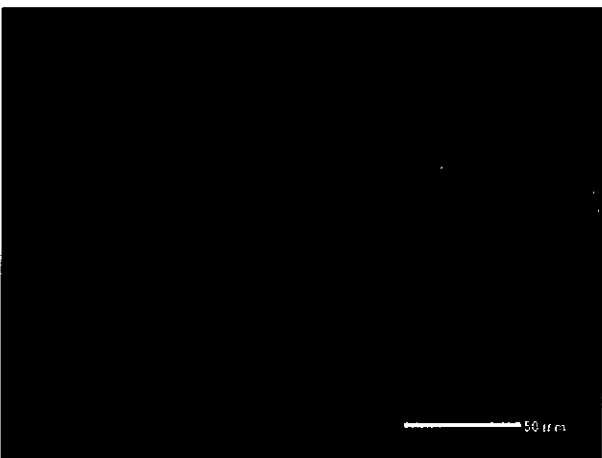
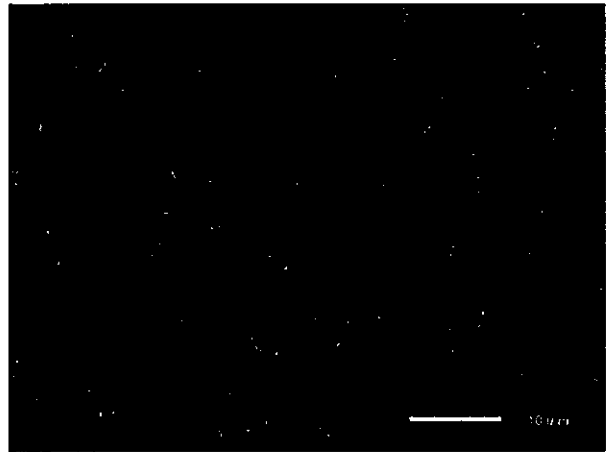
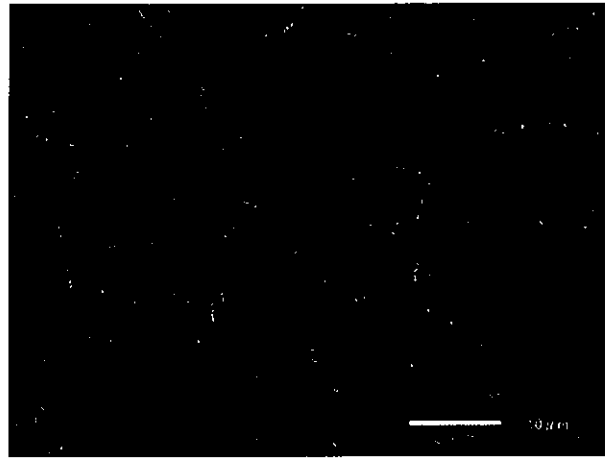
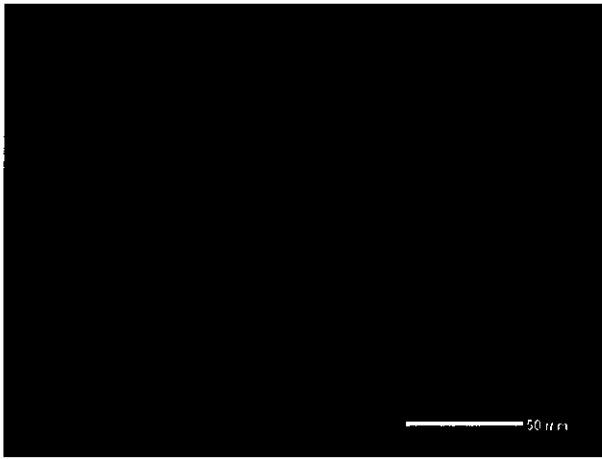


Photo II-6-6 SEM (Scanning electron microscope) observation
De-Superheater-Right (Circumferential weld : Fine grain HAZ)

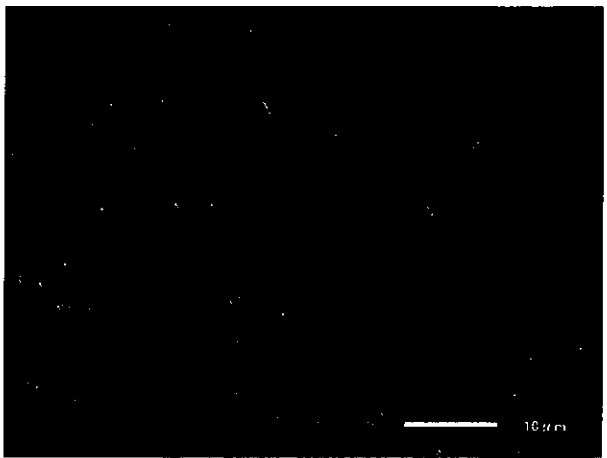
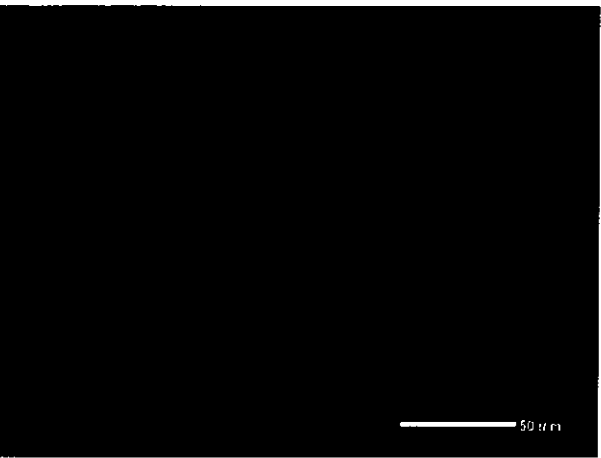
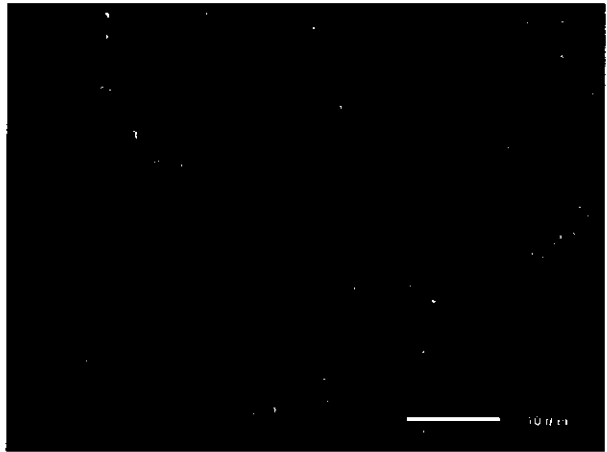
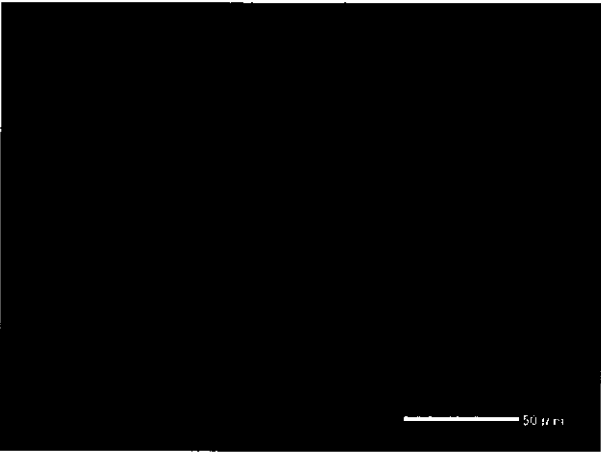
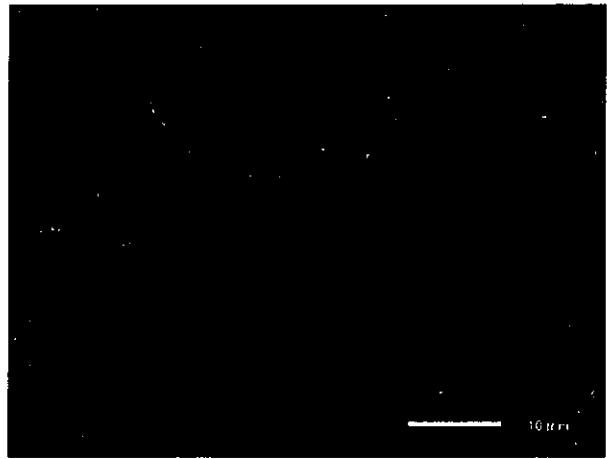
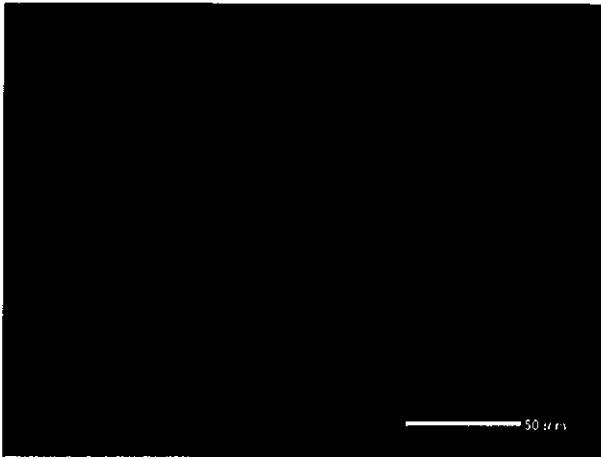


Photo II-6-7 SEM (Scanning electron microscope) observation
De-Superheater-Right (Circumferential weld: Coarse grain HAZ)

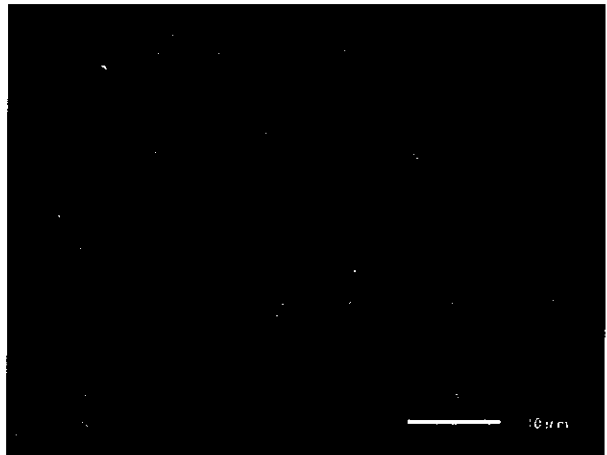
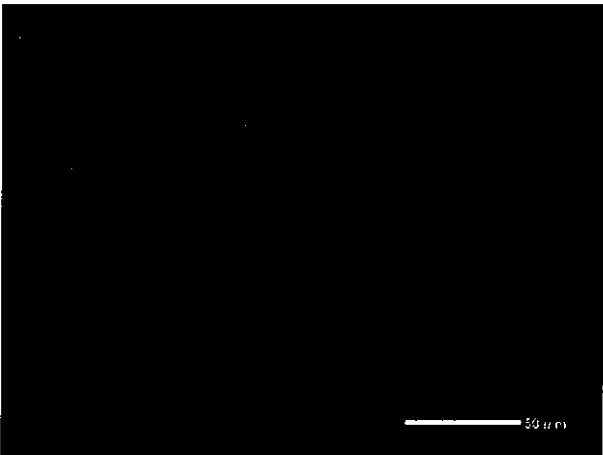
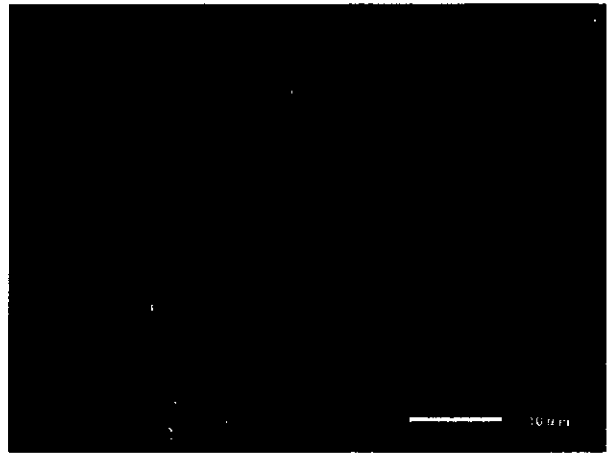
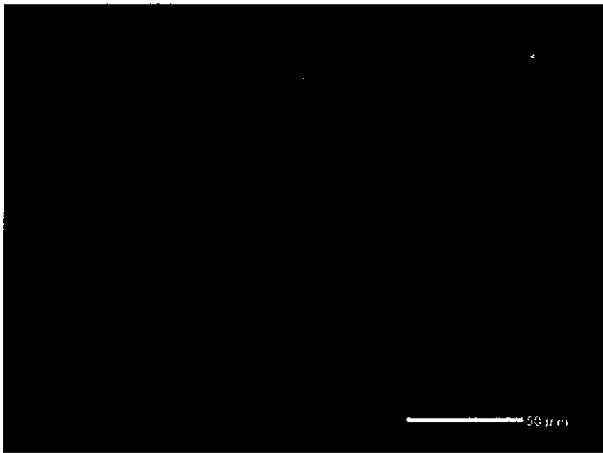
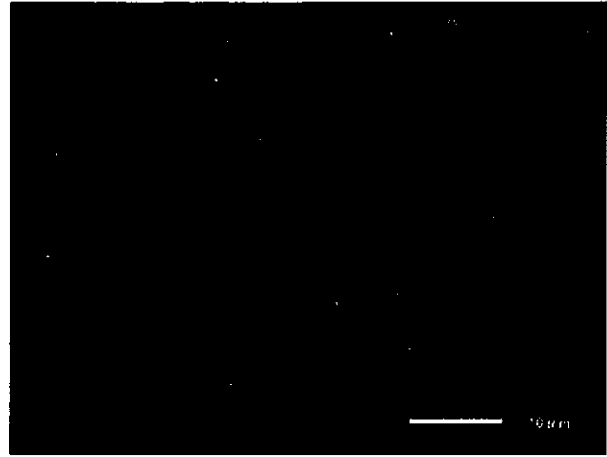
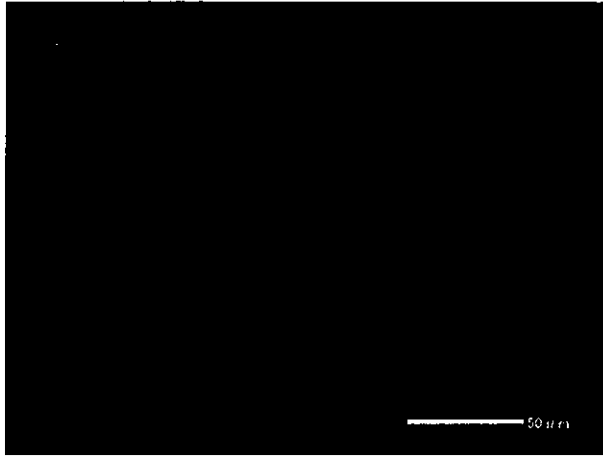


Photo II-6-8 SEM (Scanning electron microscope) observation
De-Superheater-Right (Circumferential weld : Weld metal)

025

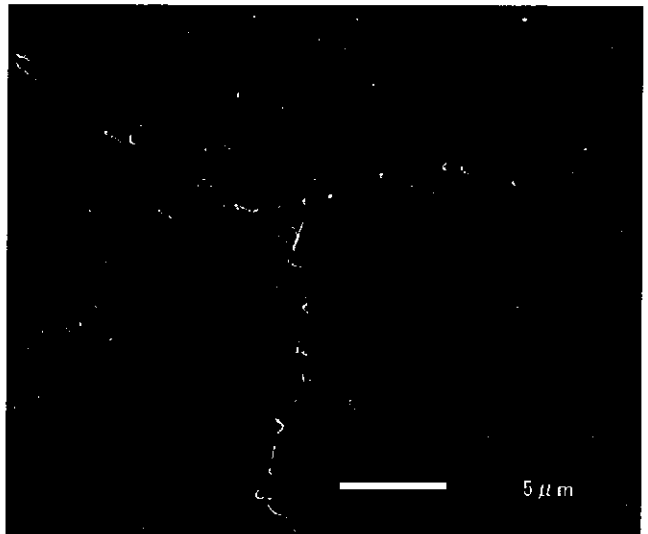
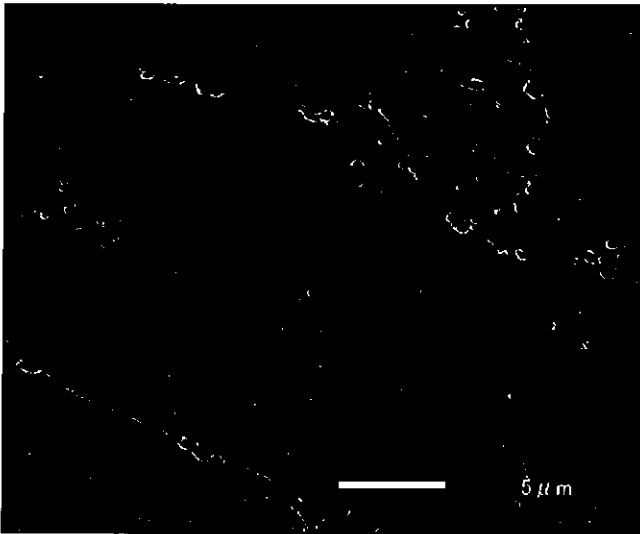
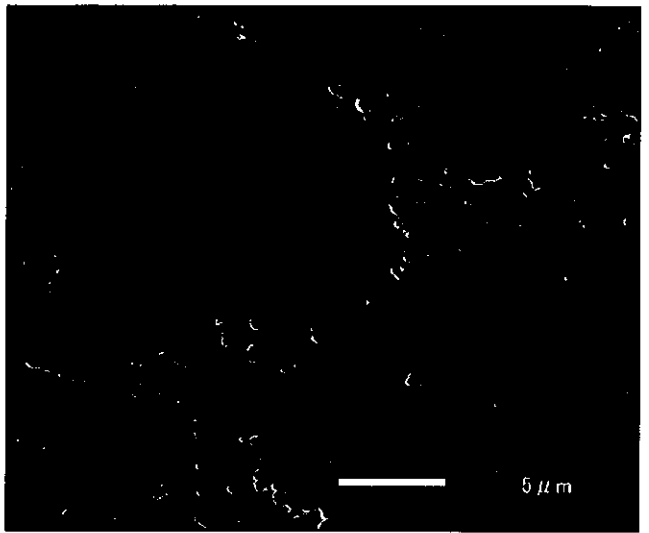
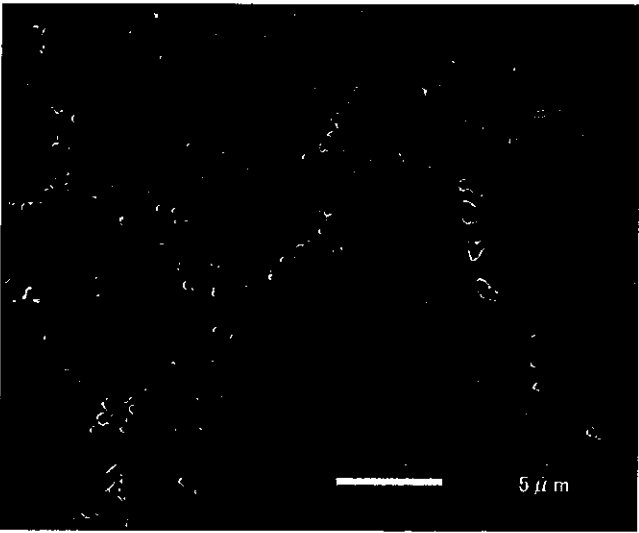
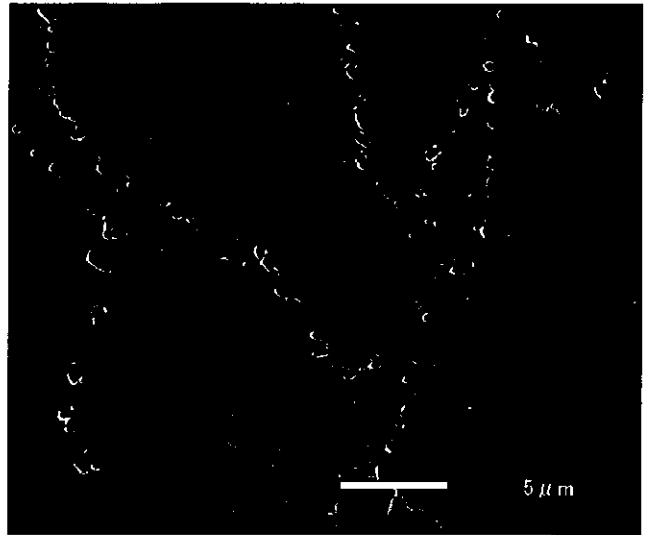
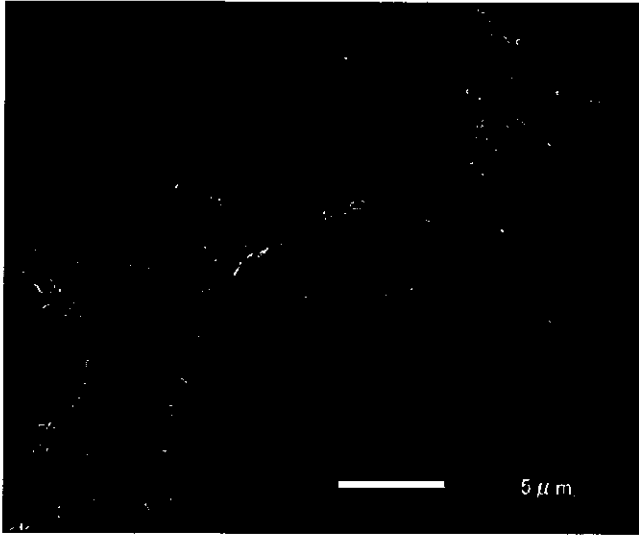


Photo II-6-9 Precipitates along grain boundary by SEM observation
De-Superheater-Right(Circumferential weld : Base metal)

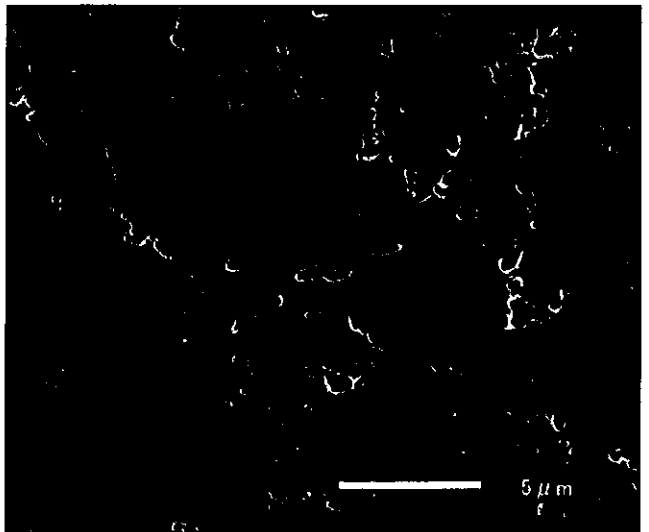
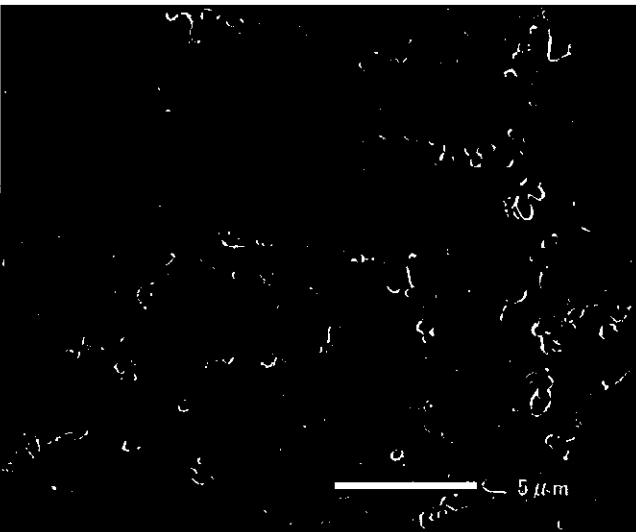
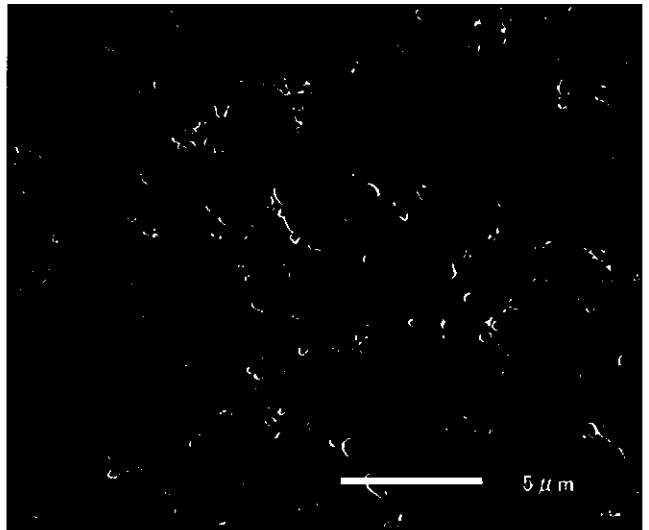
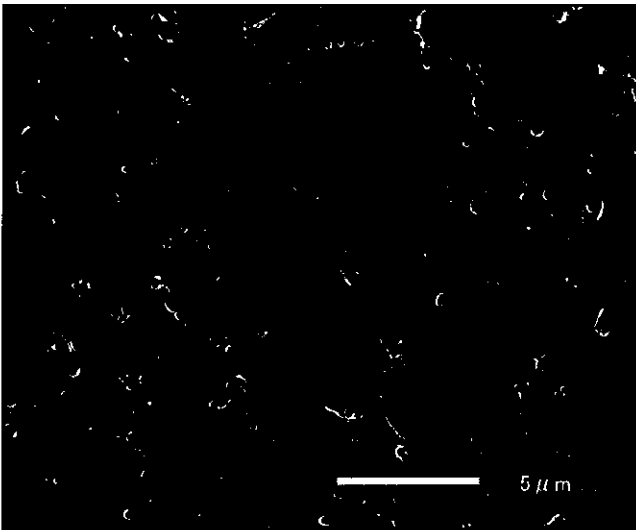
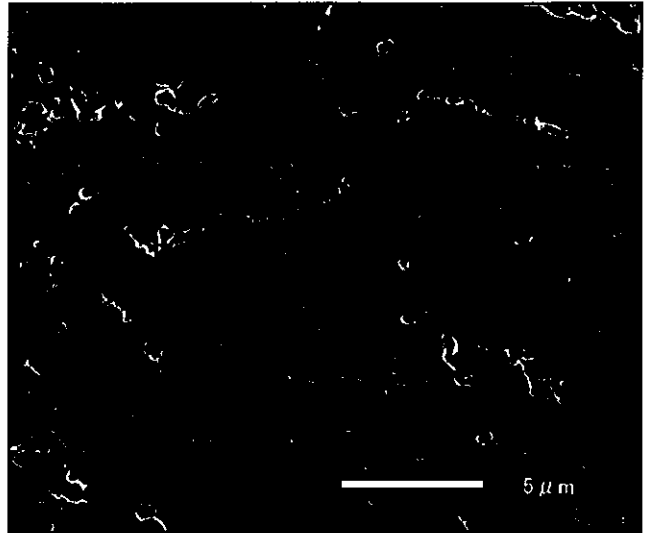
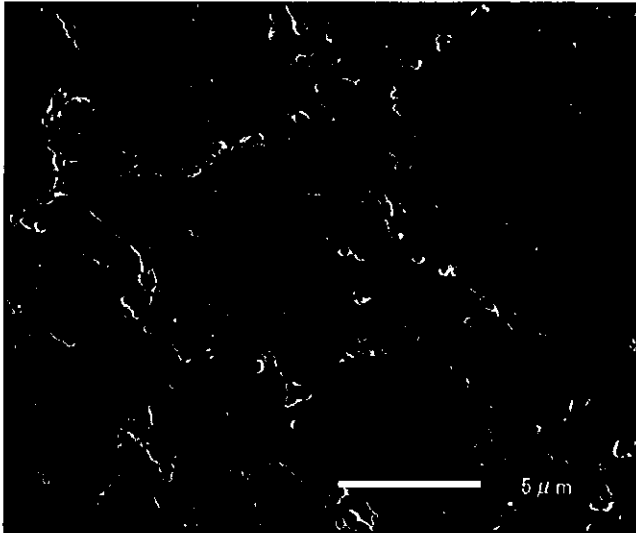
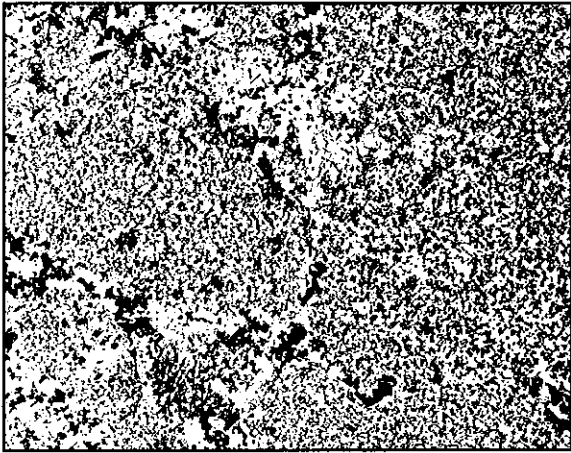
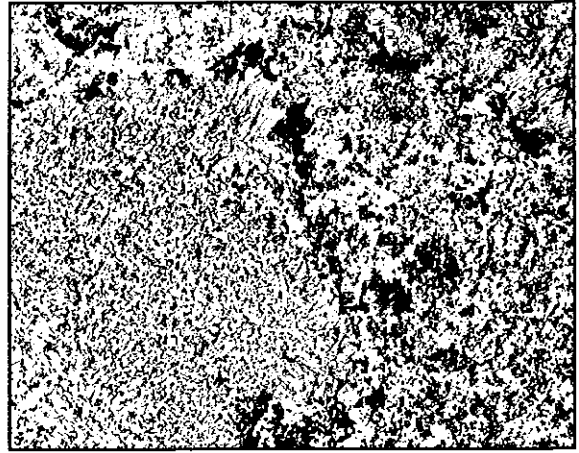


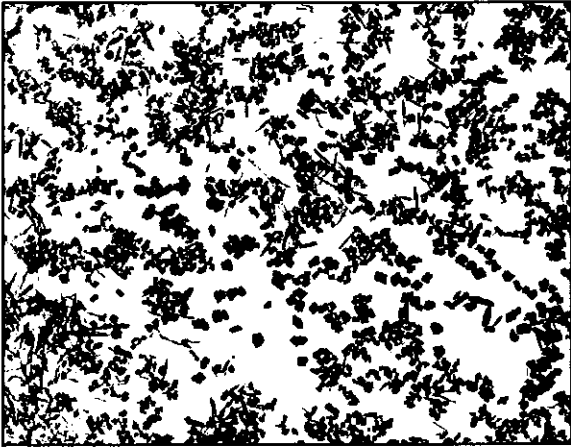
Photo II-6-10 Precipitates along grain boundary by SEM observation
De-Superheater-Right (Circumferential weld : Fine grain HAZ)



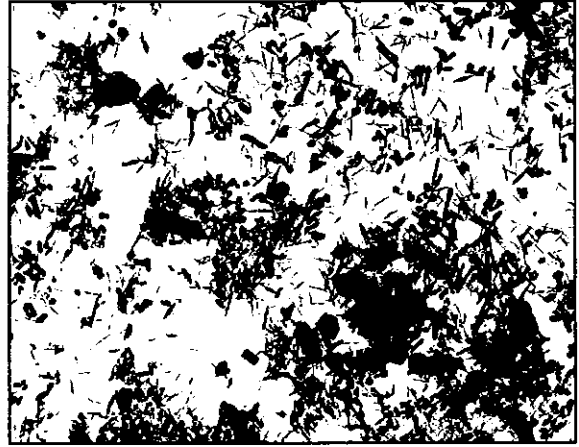
5 μ m



5 μ m



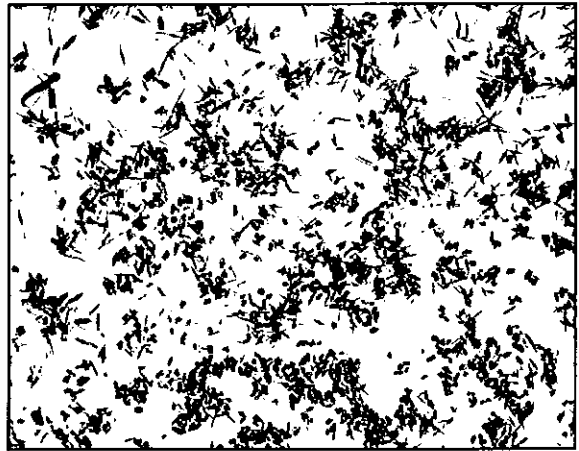
1 μ m



1 μ m

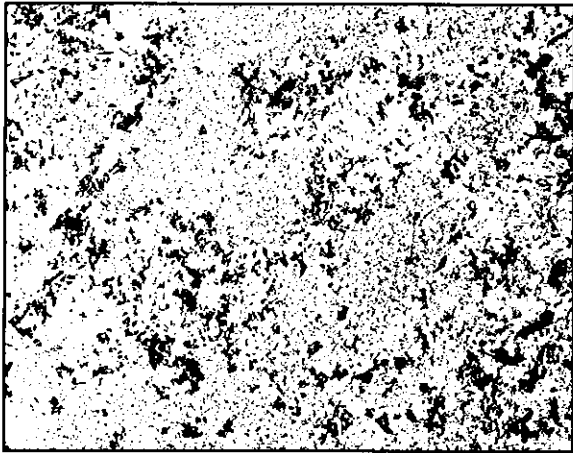


1 μ m

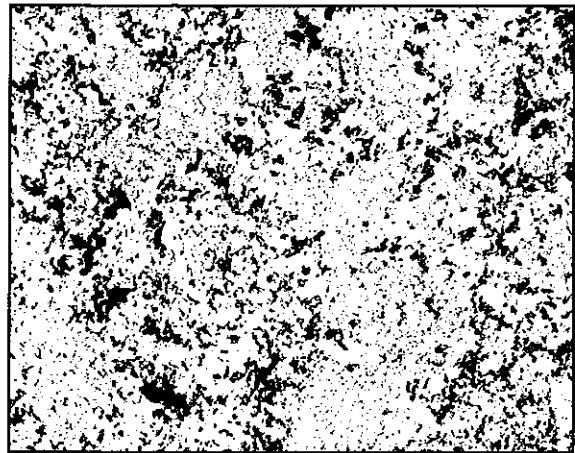


1 μ m

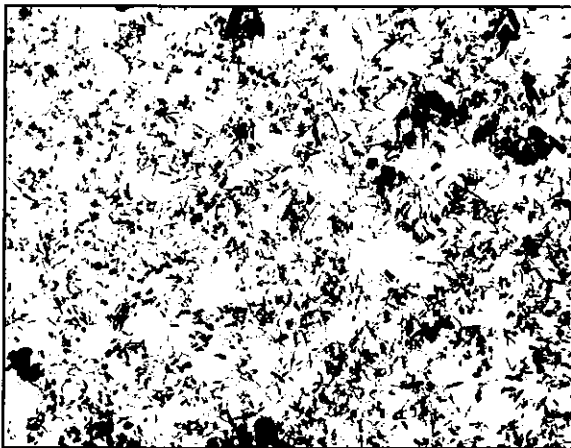
Photo II-6-11 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Right (Circumferential weld : Base metal)



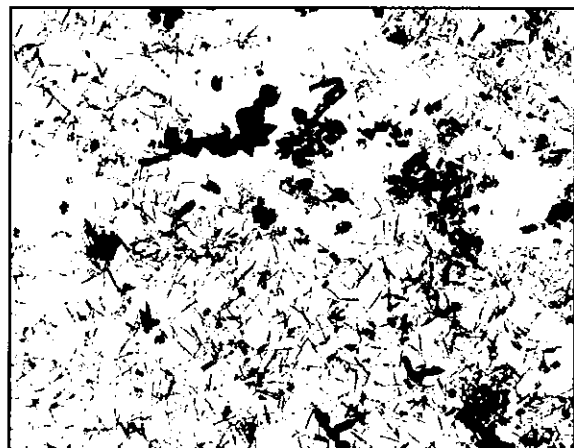
5 μm



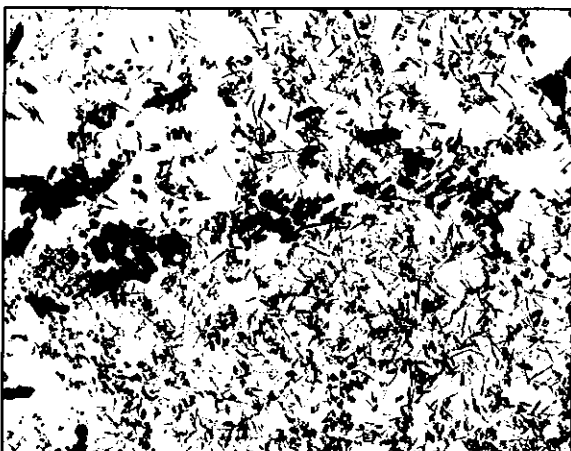
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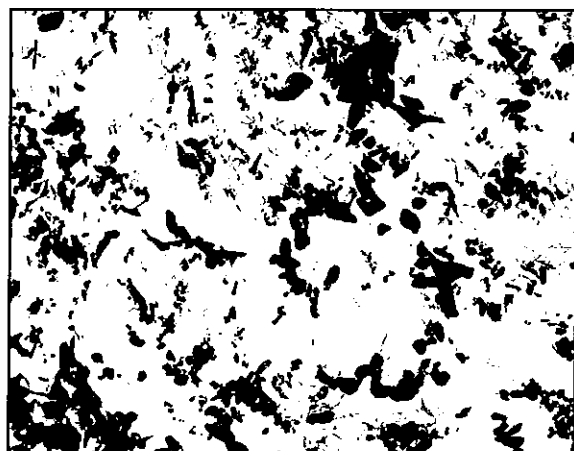
1 μm



1 μm

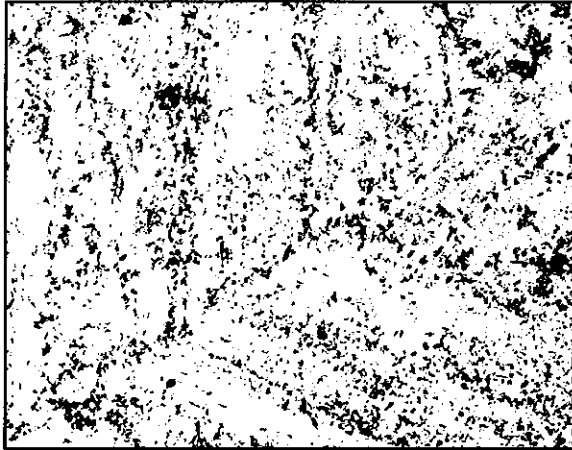


1 μm

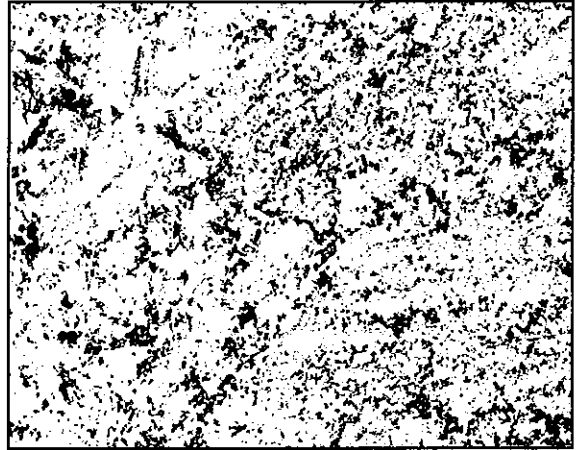


1 μm

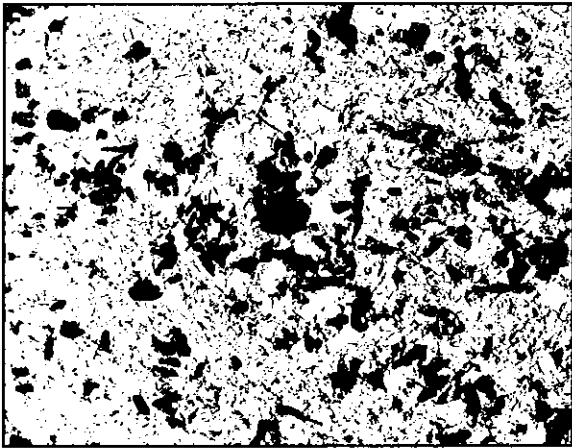
Photo II-6-12 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Right (Circumferential weld : Fine grain HAZ)



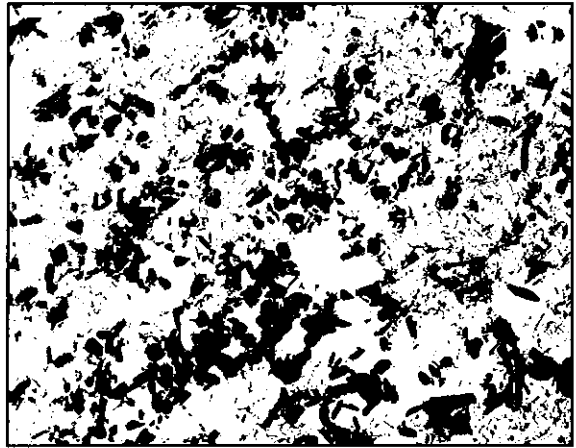
5 μm



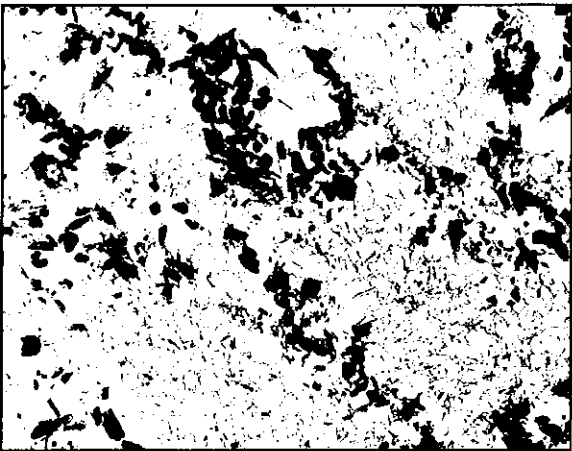
5 μm



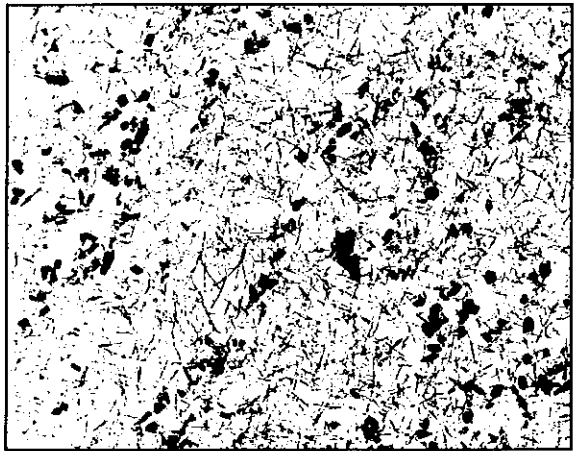
1 μm



1 μm

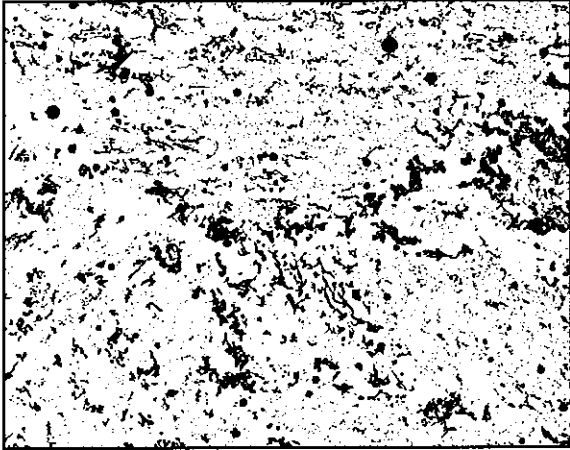


1 μm

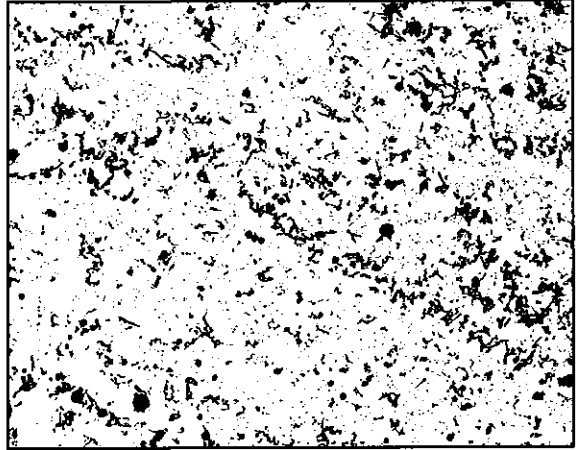


1 μm

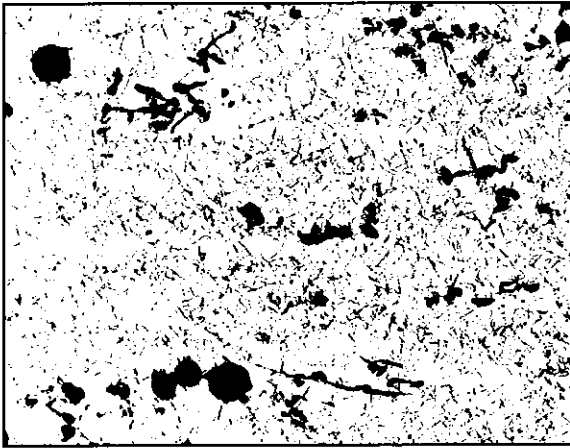
Photo II-6-13 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Right (Circumferential weld : Coarse grain HAZ)



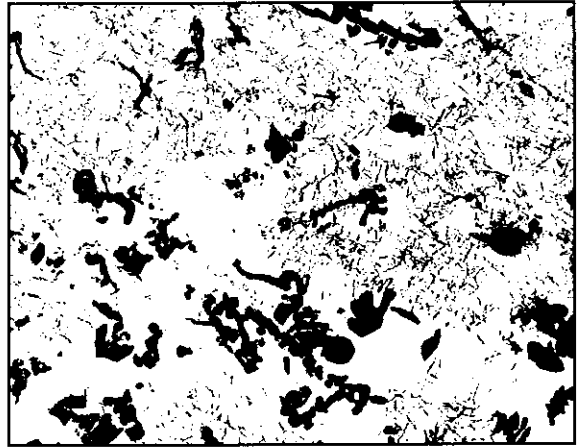
5 μm



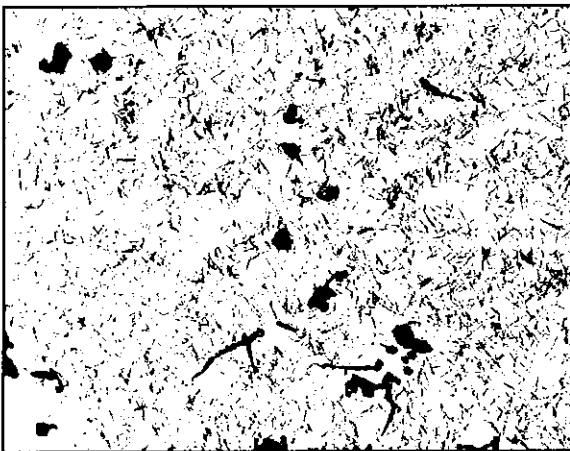
5 μm



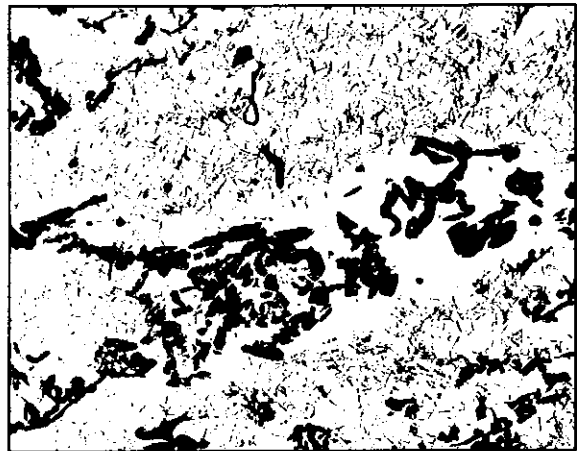
1 μm



1 μm



1 μm



1 μm

Photo II-6-14 Precipitates by TEM (Transmission electron microscope) observation
De-Superheater-Right (Circumferential weld : Weld metal)

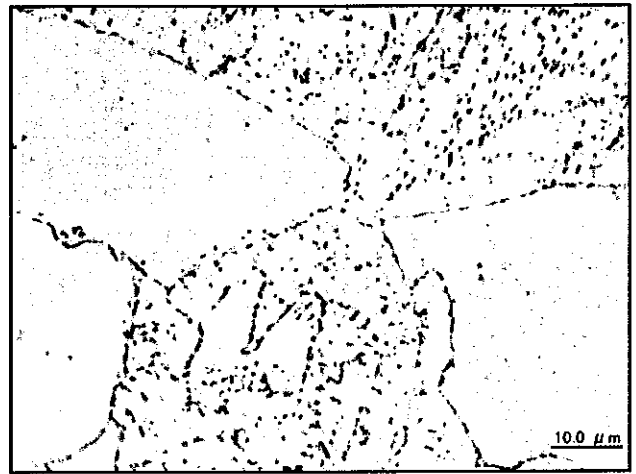
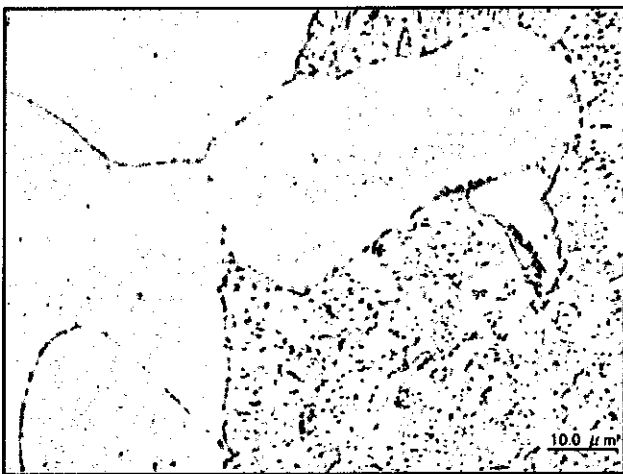
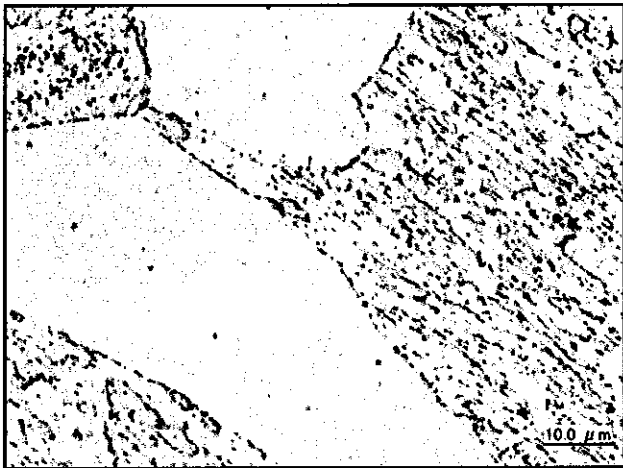


Photo II-7-1 Microstructure observation
RH Outlet Header (Circumferential weld at left side : Base metal)

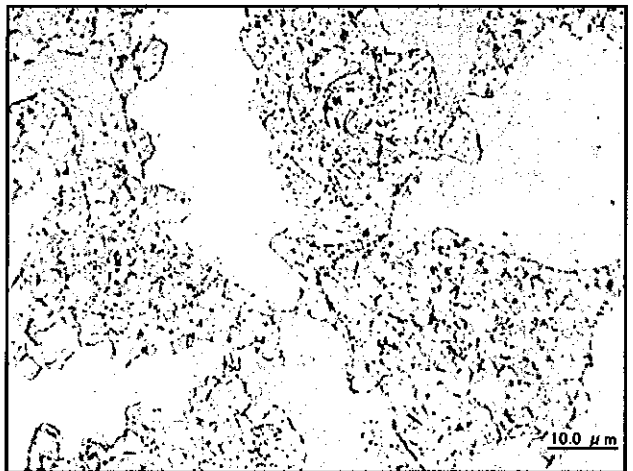
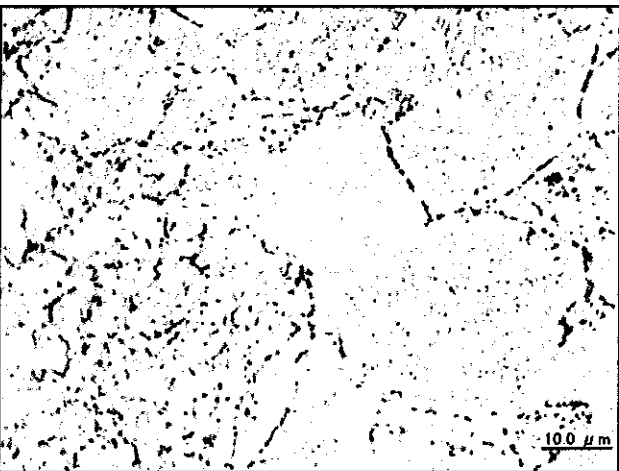
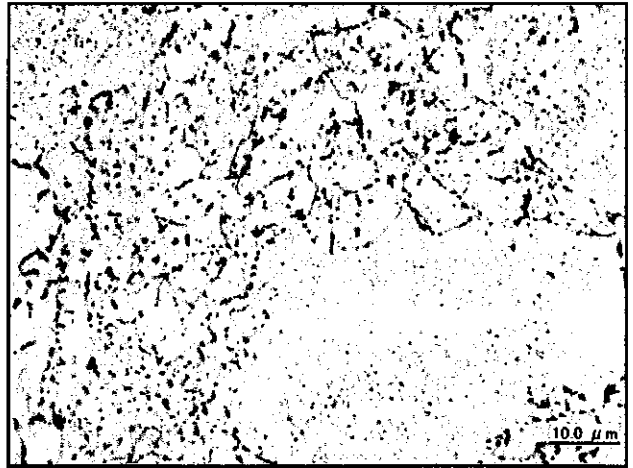
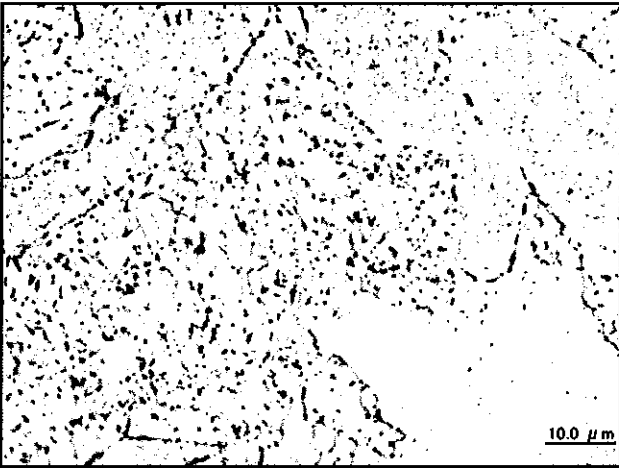
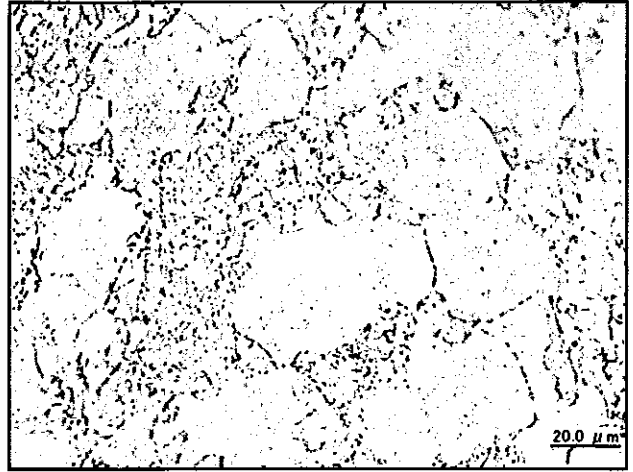
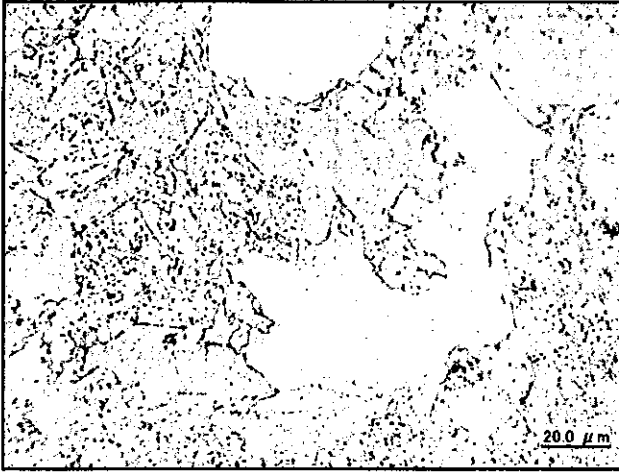


Photo II-7-2 Microstructure observation
RH Outlet Header (Circumferential weld at left side : Intercritical zone)

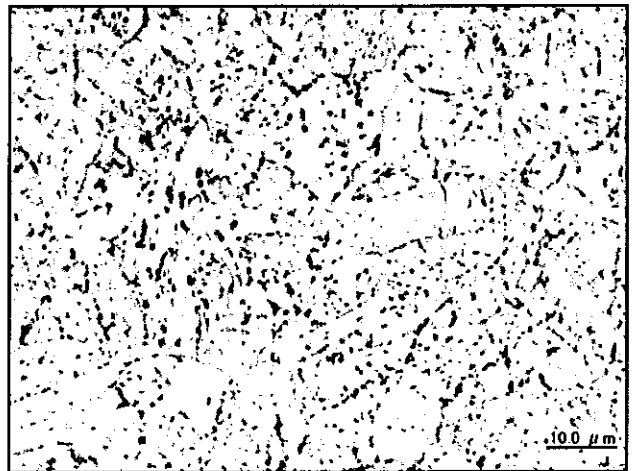
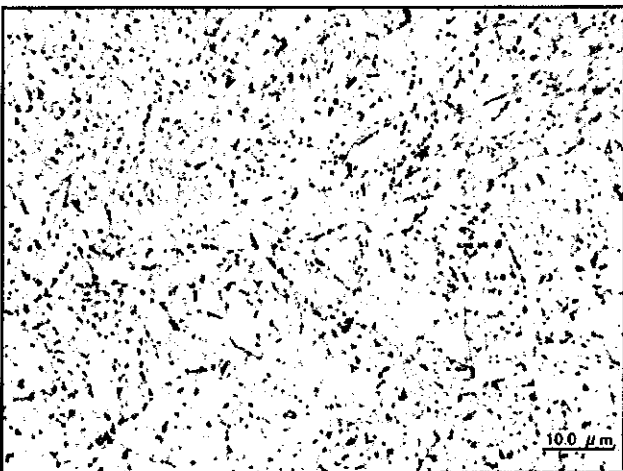
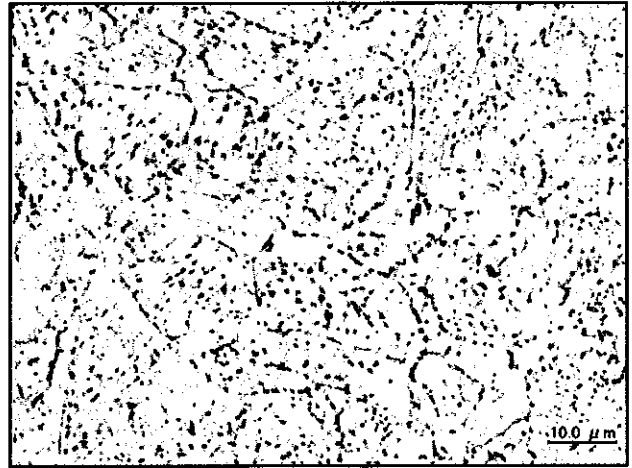
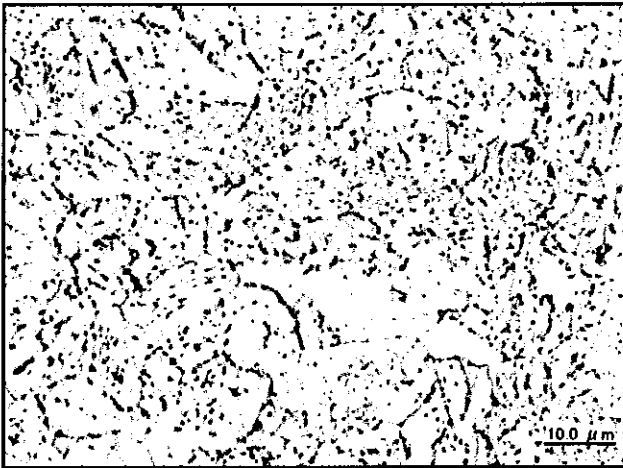


Photo II-7-3 Microstructure observation
RH Outlet Header (Circumferential weld at left side : Fine grain HAZ)

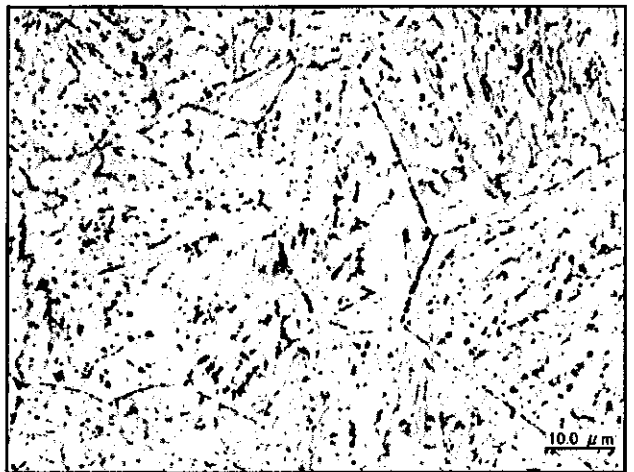
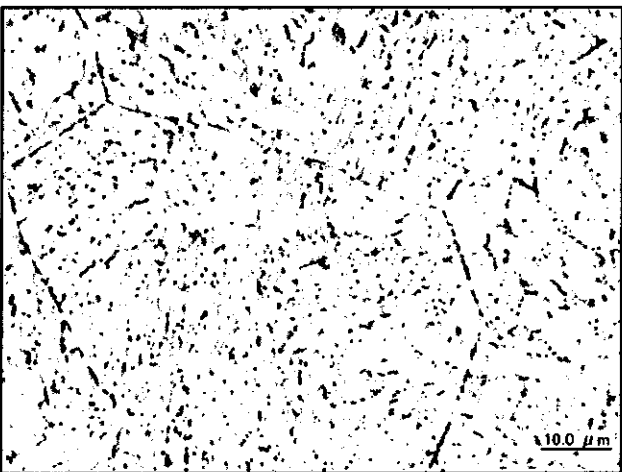
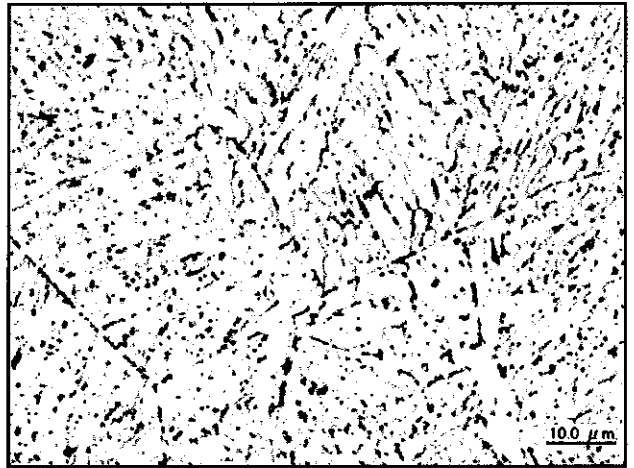
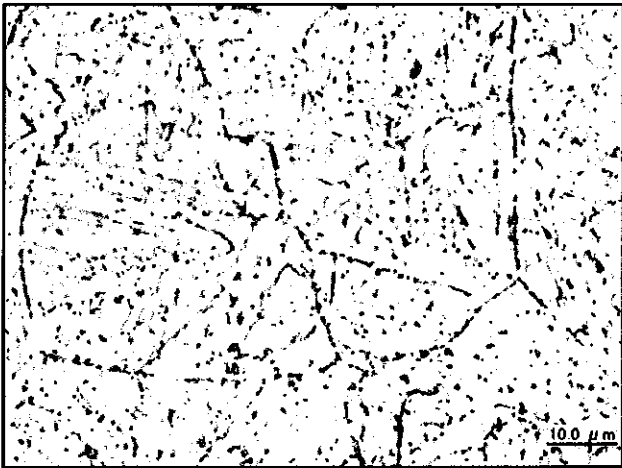
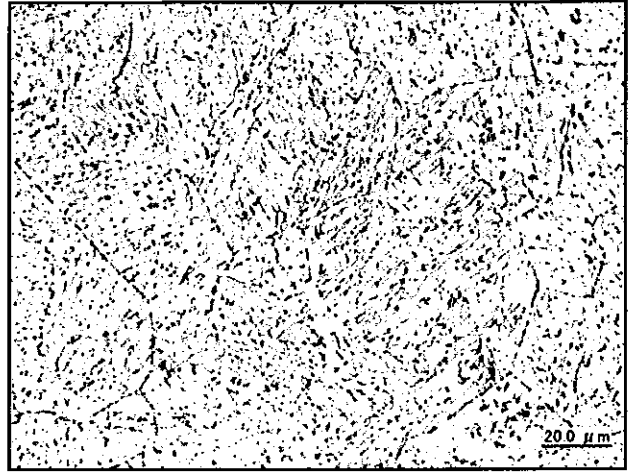


Photo II-7-4 Microstructure observation
RH Outlet Header (Circumferential weld at left side : Coarse grain HAZ)

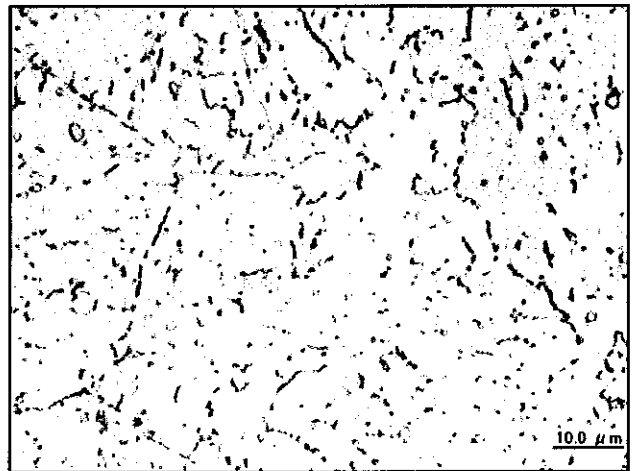
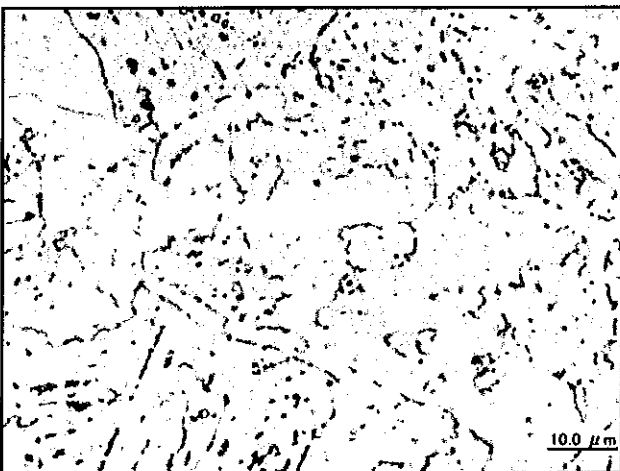
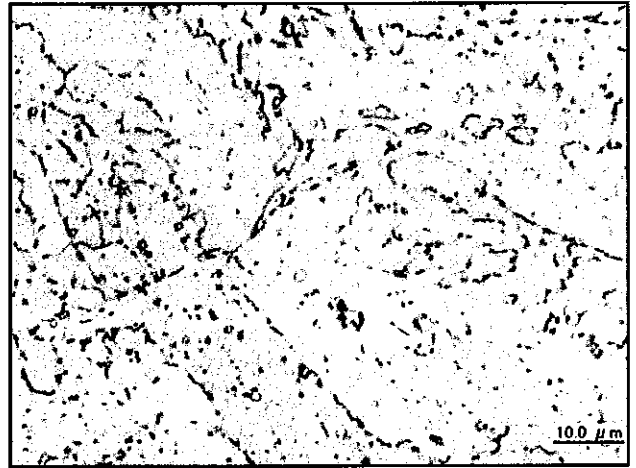
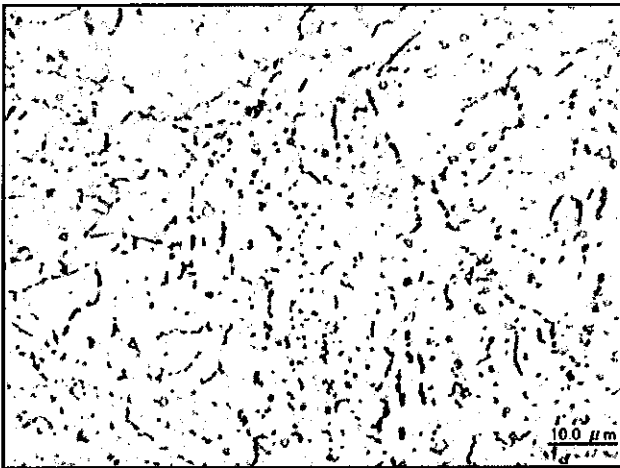
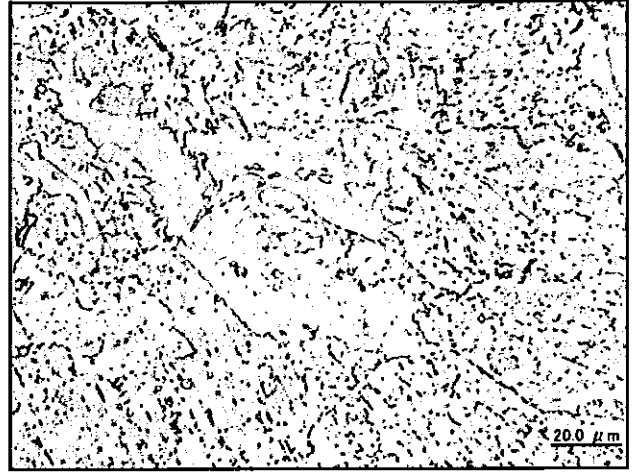


Photo II-7-5 Microstructure observation
RH Outlet Header (Circumferential weld at left side : Weld metal)

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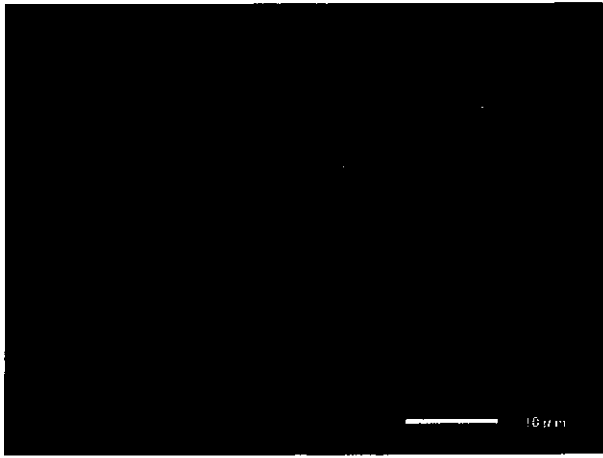
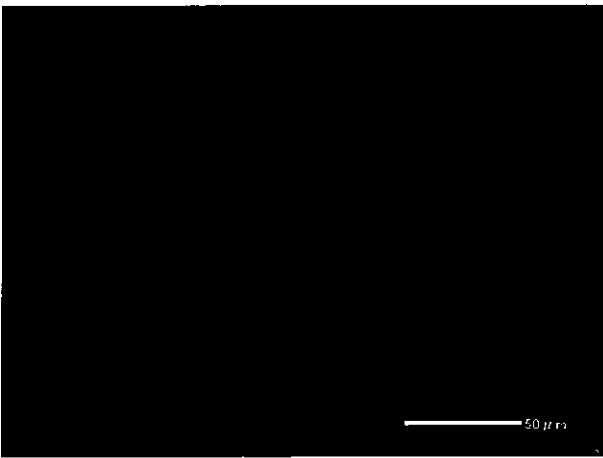
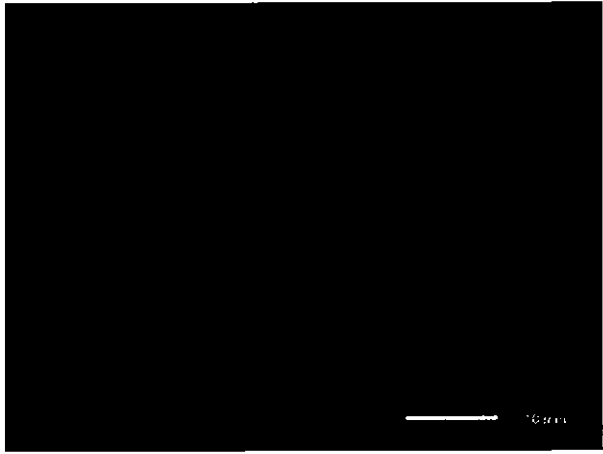
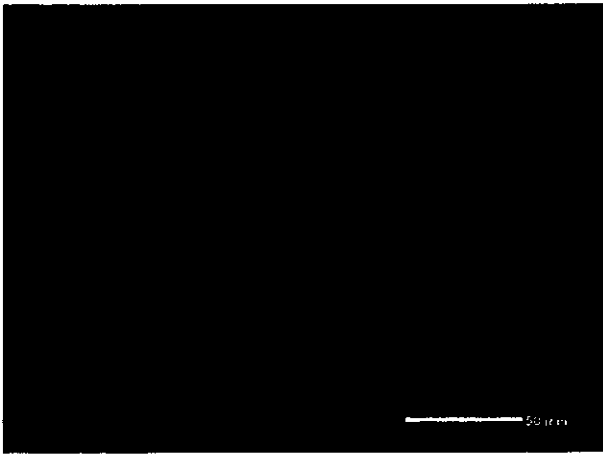
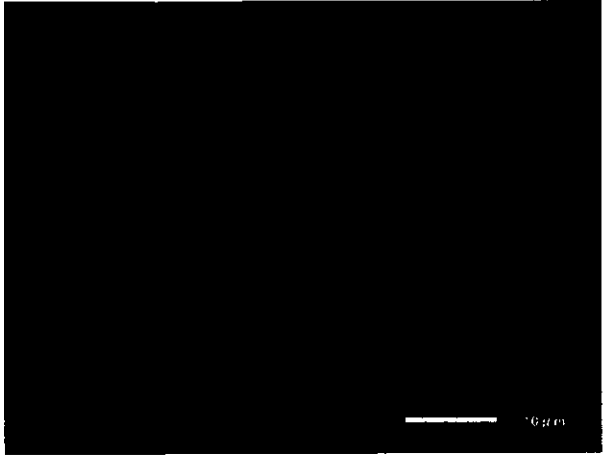


Photo II-7-6 SEM (Scanning electron microscope) observation
RH Outlet Header (Circumferential weld at left side : Fine grain HAZ)

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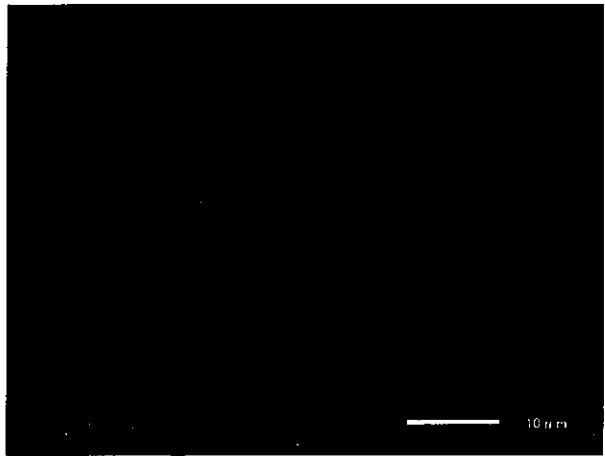
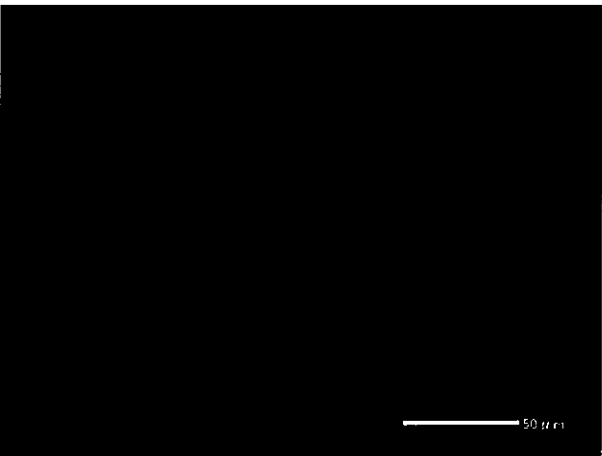
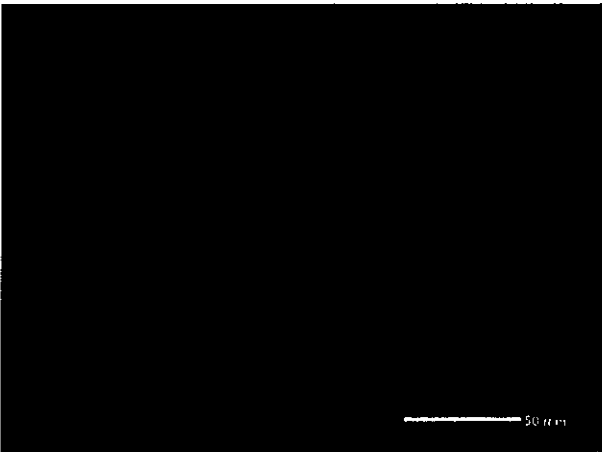
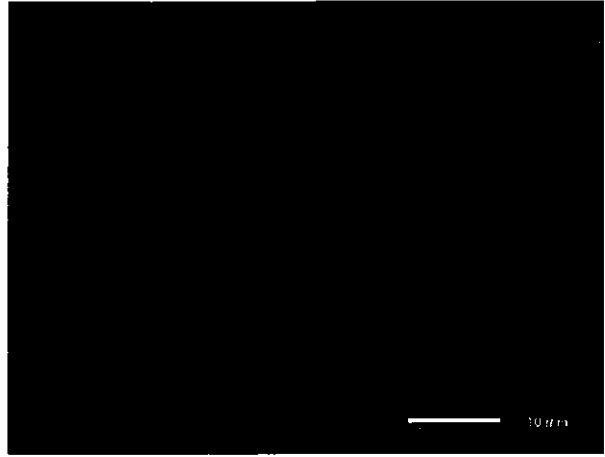
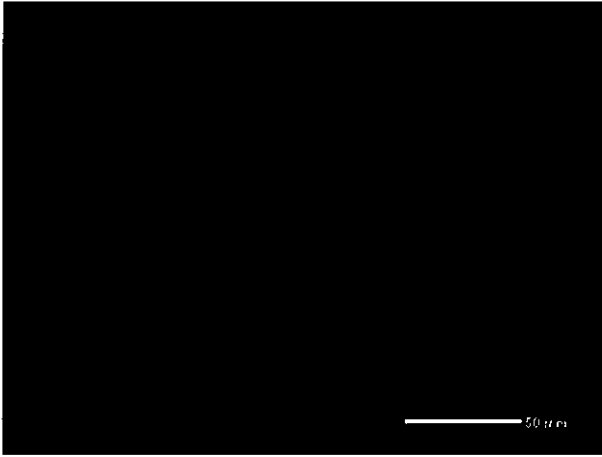
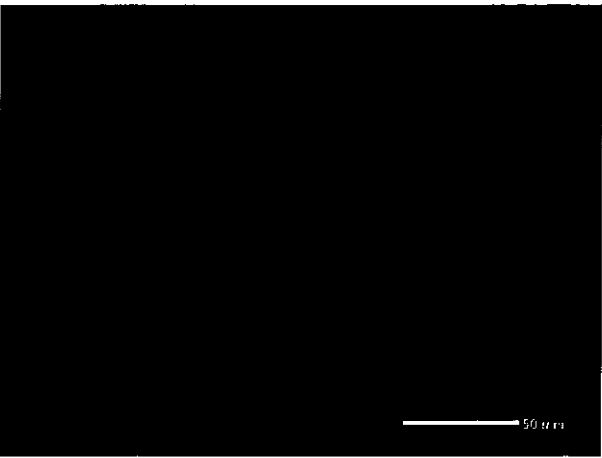
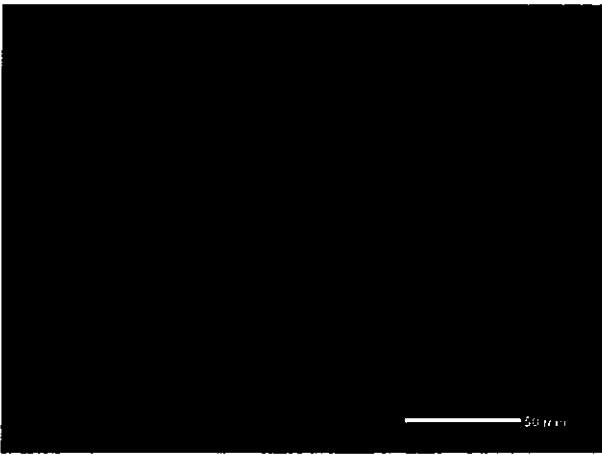
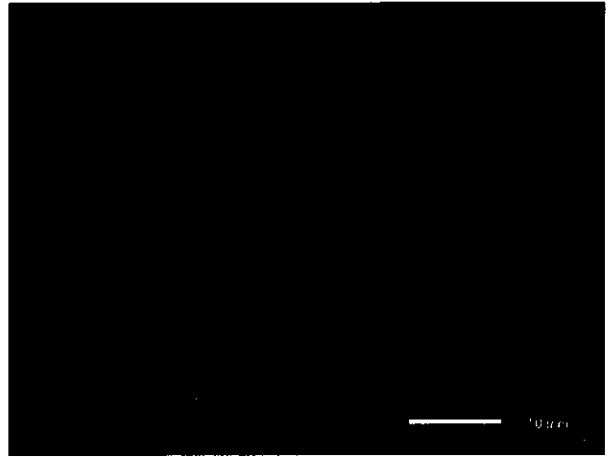
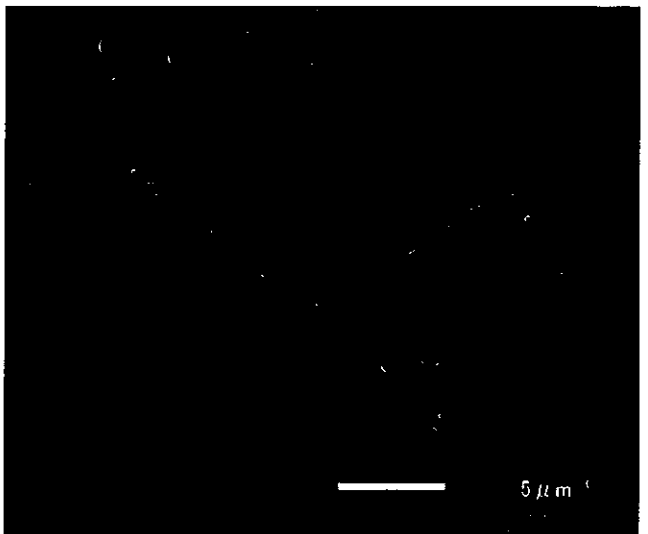
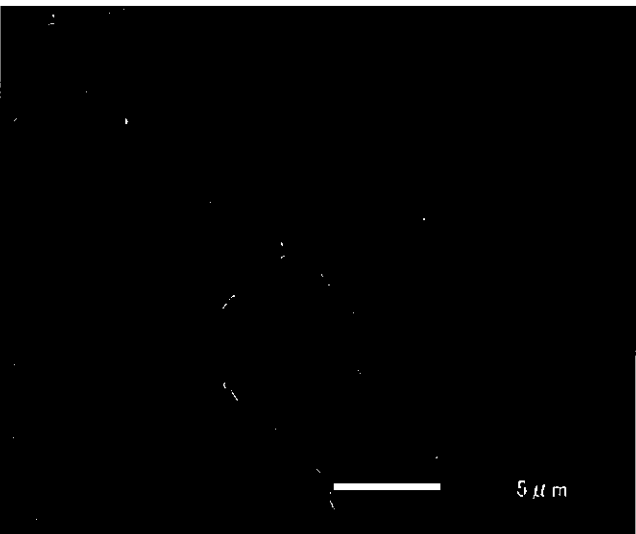
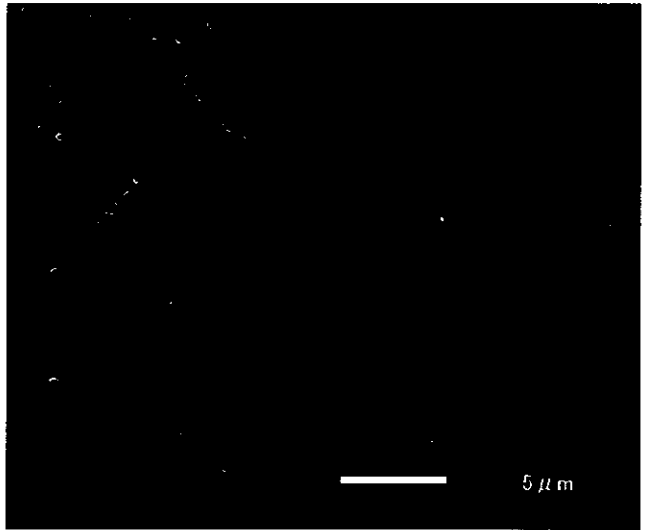
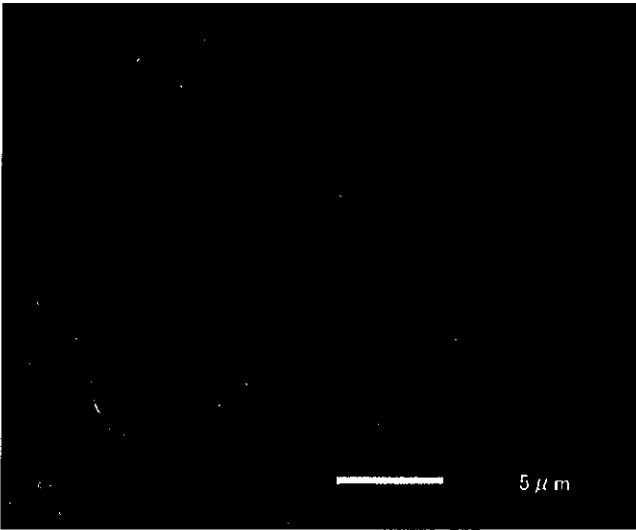
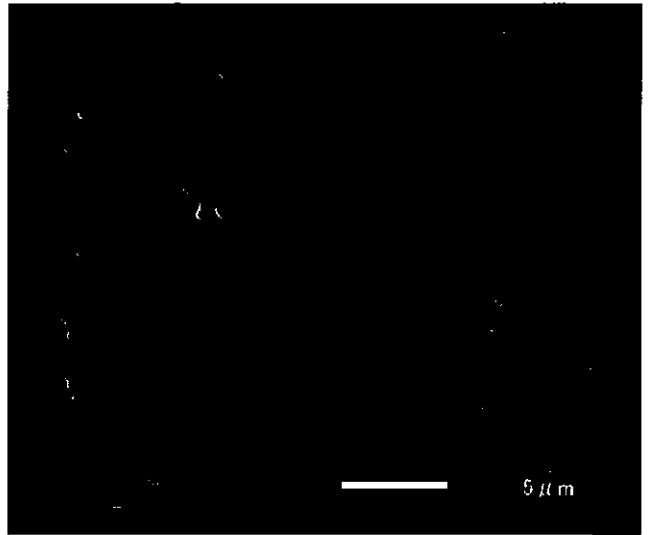
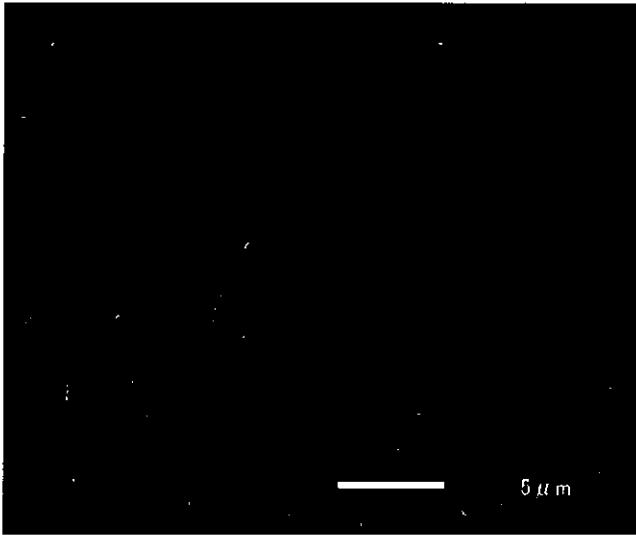


Photo II-7-7 SEM (Scanning electron microscope) observation
RH Outlet Header (Circumferential weld at left side : Coarse grain HAZ)



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A

Photo II-7-8 SEM(Scanning electron microscope) observation
RH Outlet Header(Circumferential weld at left side : Weld metal)



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Photo II-7-9 Precipitates along grain boundary by SEM observation
RH Outlet Header (Circumferential weld at left side : Base metal)

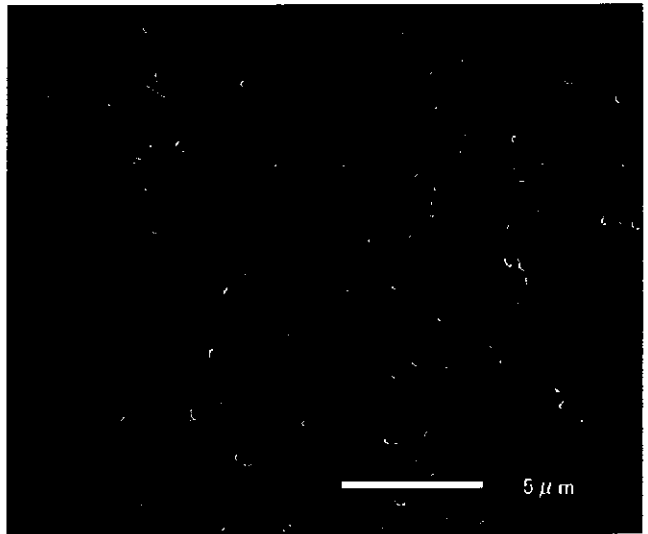
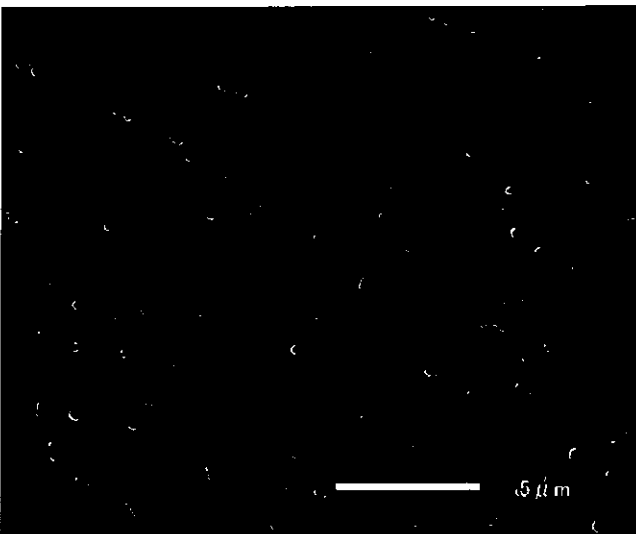
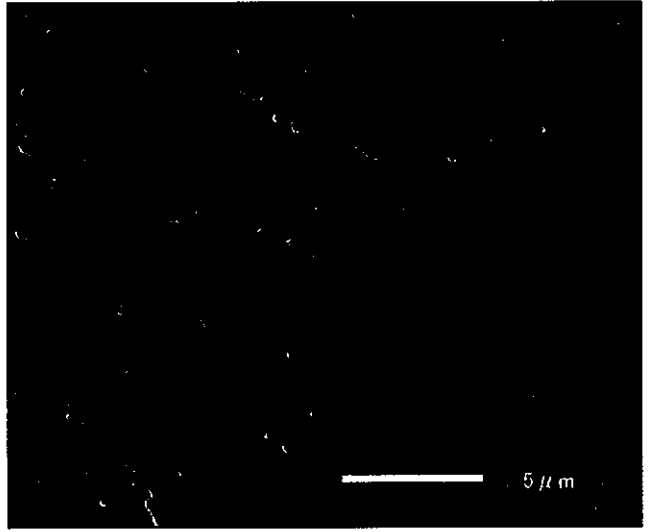
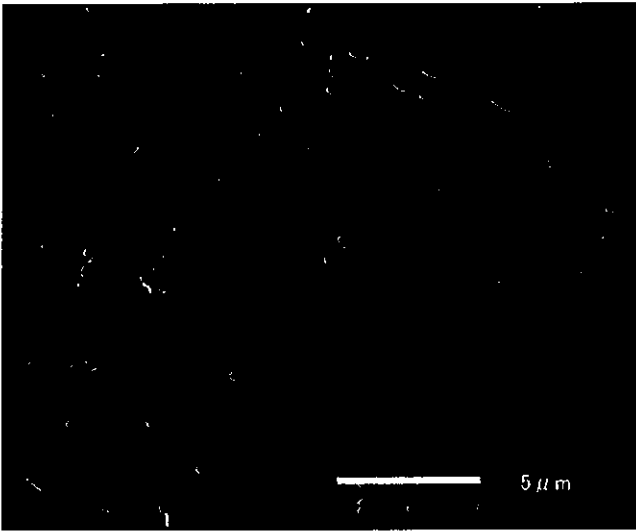
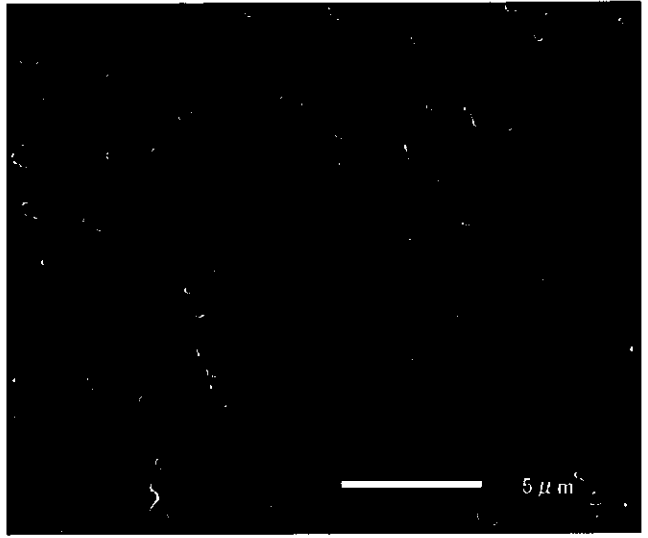
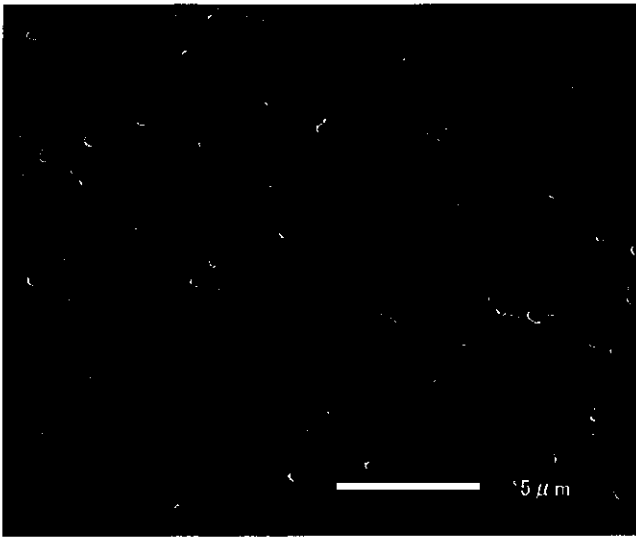


Photo II-7-10 Precipitates along grain boundary by SEM observation
RH Outlet Header (Circumferential weld at left side : Fine grain HAZ)