

**RESULTATS D'ANALYSE SUR
Ø250-240 MM -
ACTX AEAG ADEB**

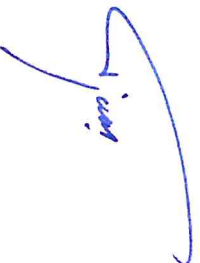
12/12/17

Mis à jour le 23/03/2018

Mis à jour le 21/05/2019

A.PETIT JEAN

Méthodes et développement

A handwritten signature in blue ink, appearing to read 'A. Petit Jean'.

L. CLUZEL

Métallurgie

~~Laurent CLUZEL~~

UKAD - Métallurgie / Metallurgy
Par délégation du Responsable Qualité
By delegation from Quality Manager

A close-up photograph of a metallic, possibly titanium, component with a complex, curved shape and several small holes and features. The component is set against a white background with a red and orange border.

QUALIFICATION SELON FCF 16-112 - Ø250-240 MM

□ Macrostructure

- Taille de grain
- β fleck : 970°C / 1h / Air

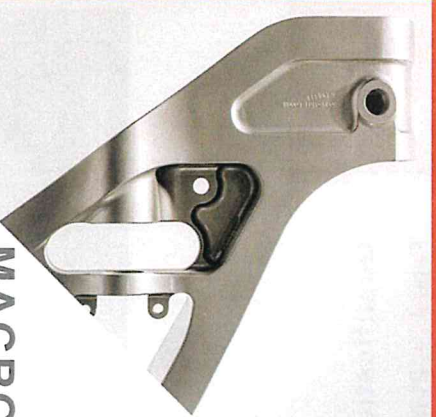
□ Microstructure

- Microstructure
- Chimie
- β transus par micrographie

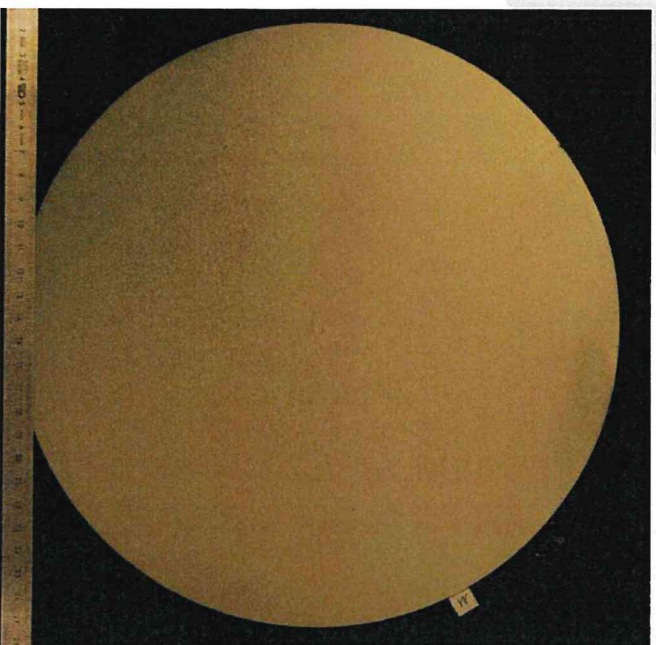
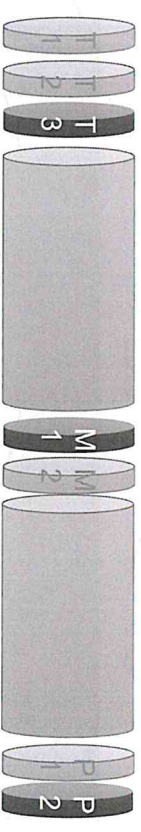
□ Caractéristiques mécaniques

- Traction

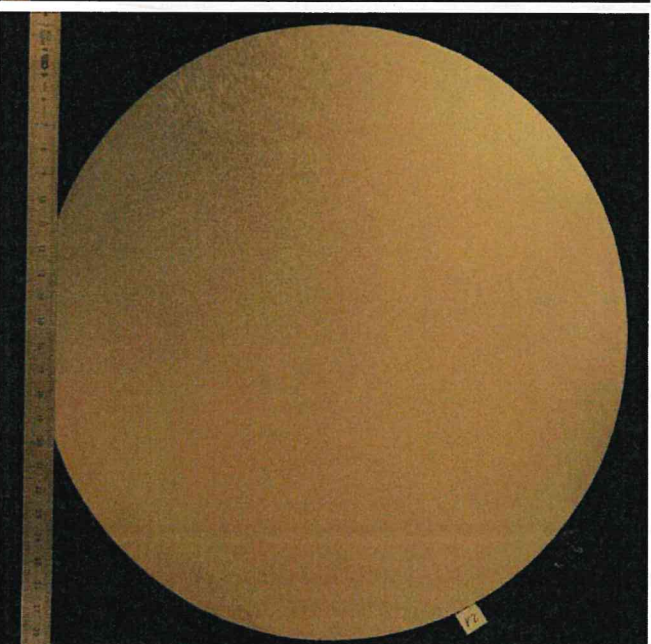
MACROSTRUCTURE - PLAQUETTE T3 / M1 / P2



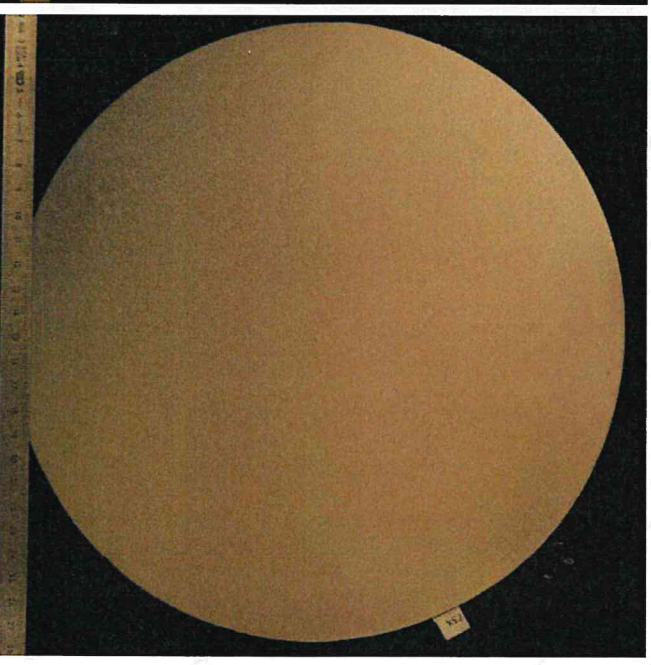
MACROGRAPHIE SUIVANT AMS2380 - ACTX



T3 - Niveau 30

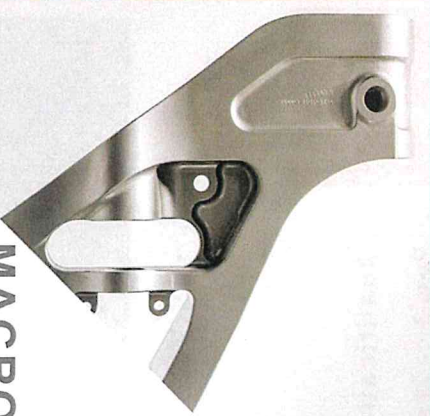


M1 - Niveau 30

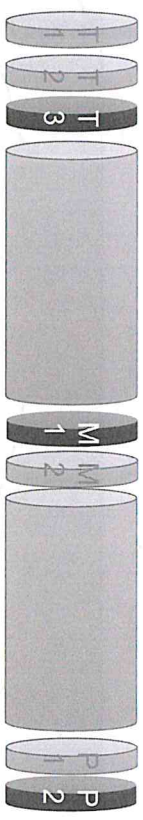


P2 - Niveau 20

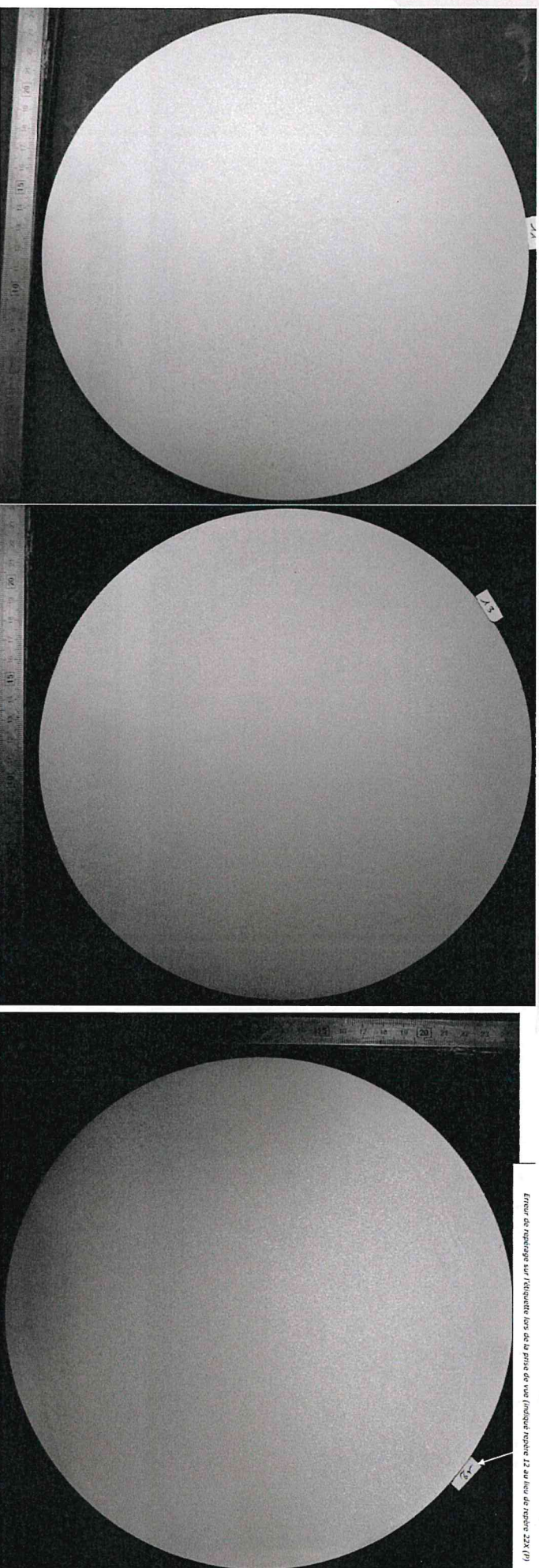
MACROSTRUCTURE - PLAQUETTE T3 / M1 / P2



MACROGRAPHIE SUIVANT AMS2380 - AEAG



Erreur de repérage sur l'étiquette lors de la prise de vue (indiquer repère 12 au lieu de repère 22X (P))

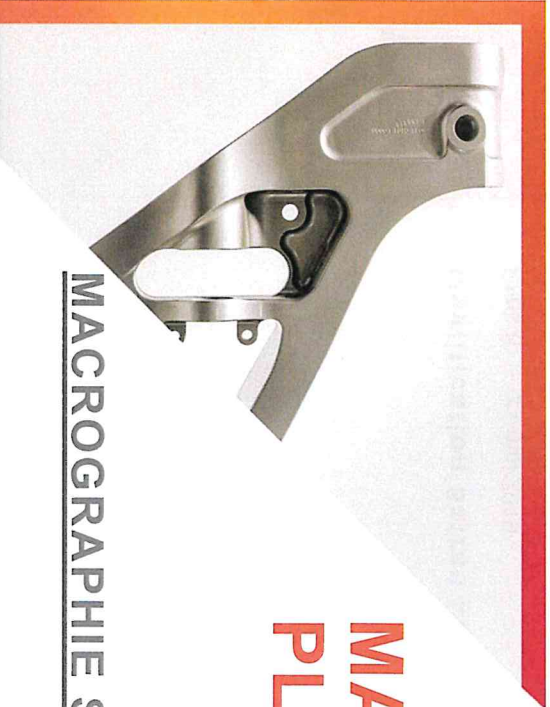


T3 - Niveau 20

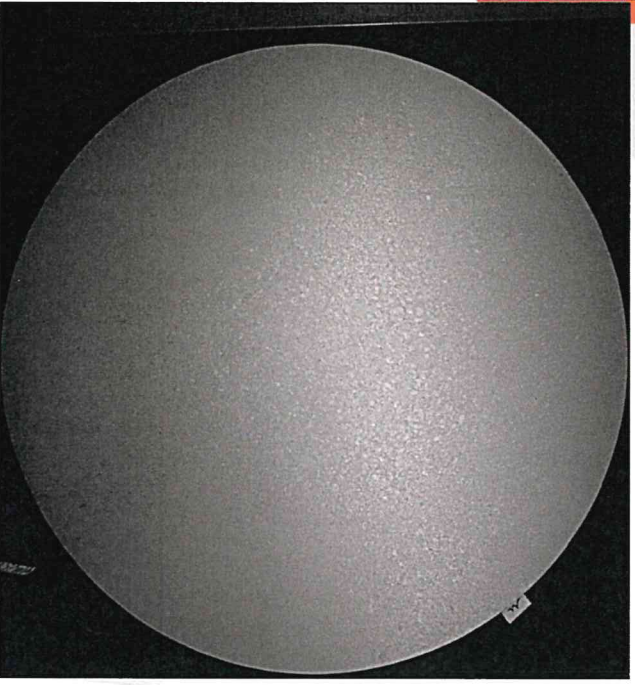
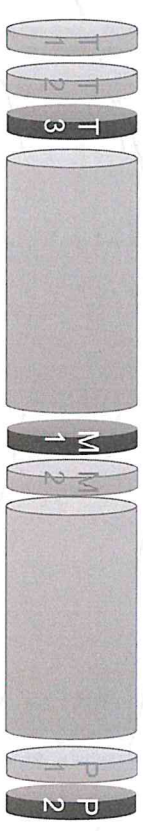
M1 - Niveau 10
1 annulaire côté peau

P2 - Niveau 10
3 annulaires côté peau

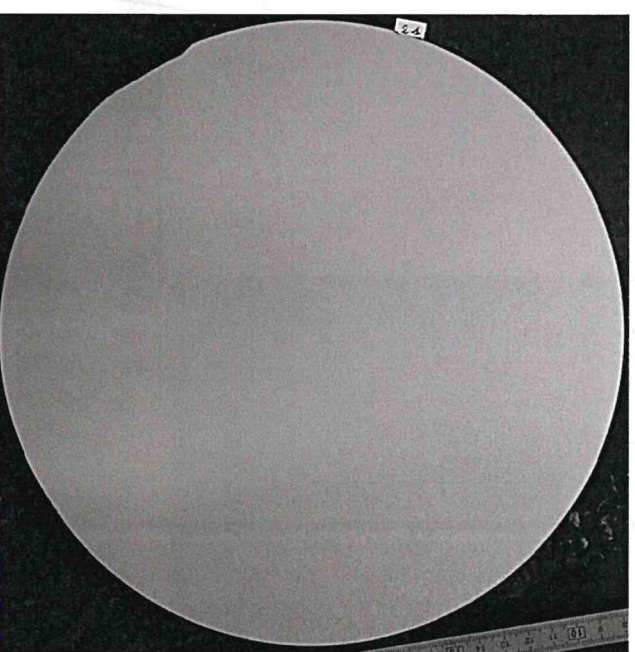
MACROSTRUCTURE - PLAQUETTE T3 / M1 / P2



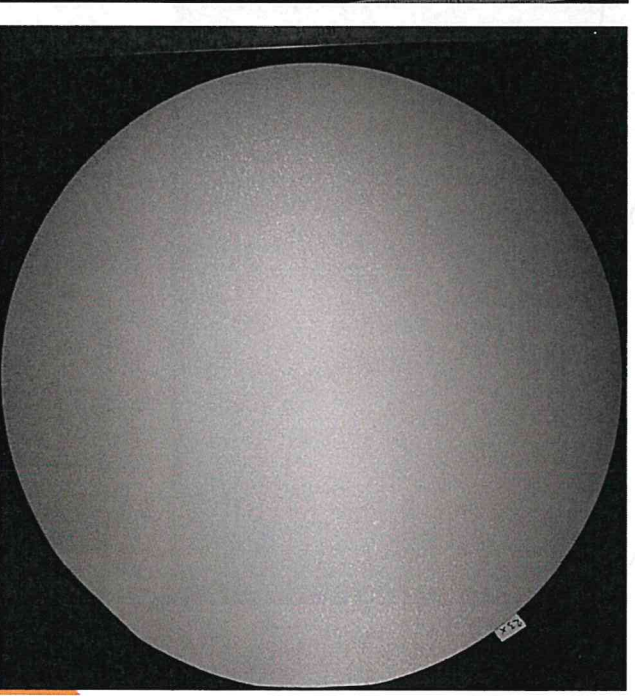
MACROGRAPHIE SUIVANT AMS2380 - ADEB



T3 - Niveau 30



M1 - Niveau 20



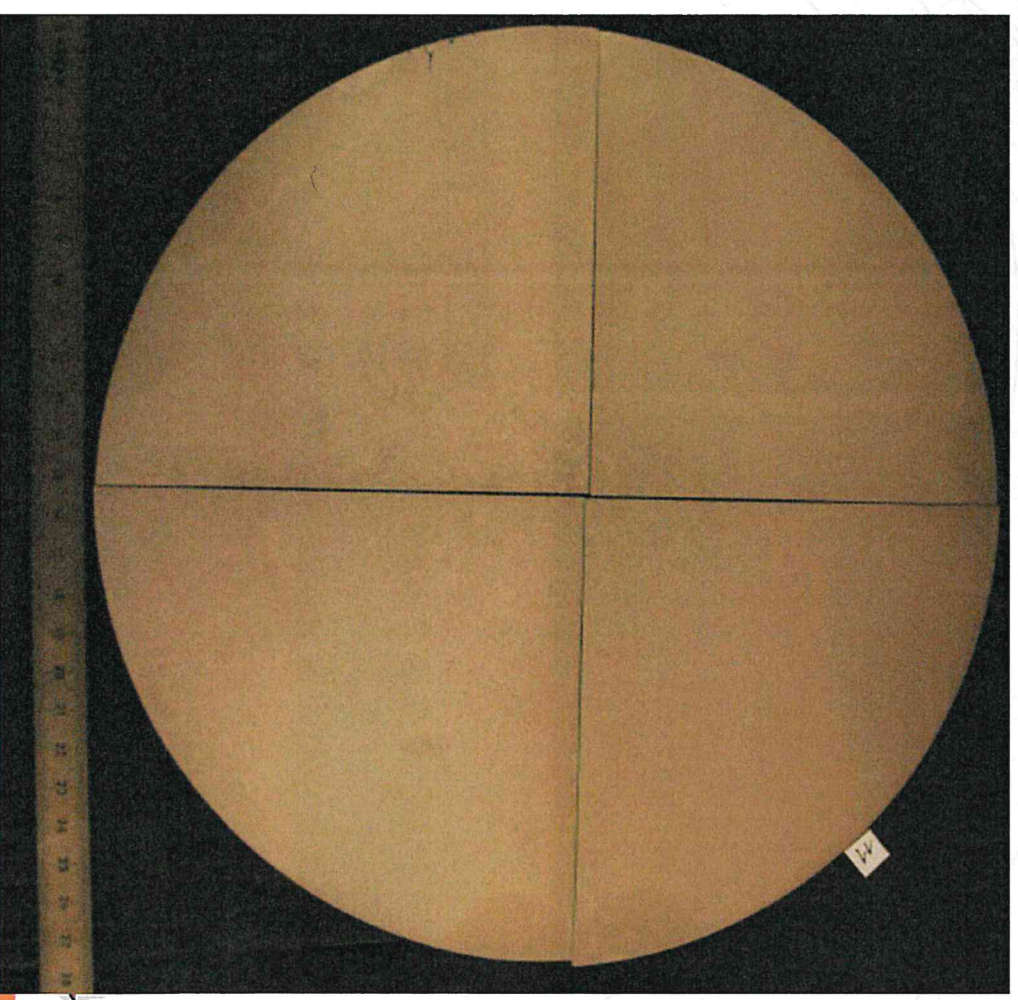
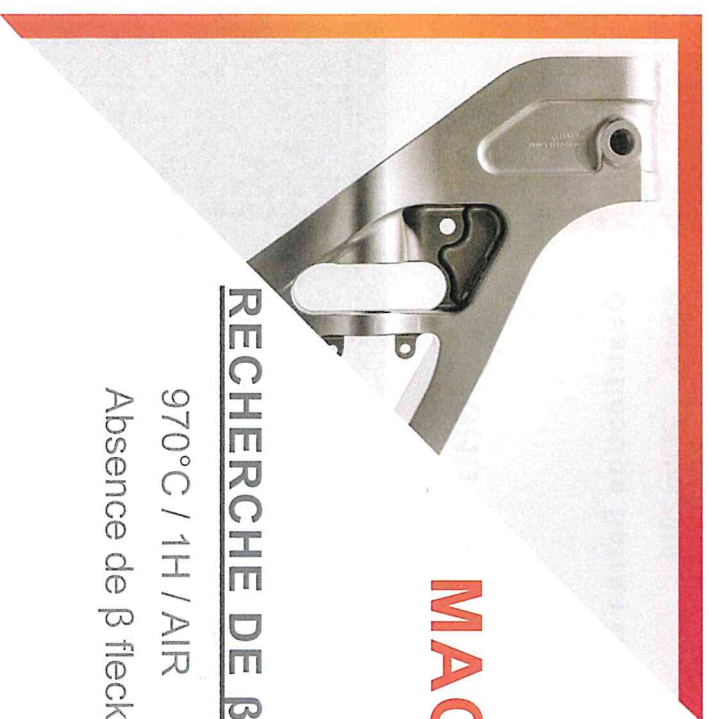
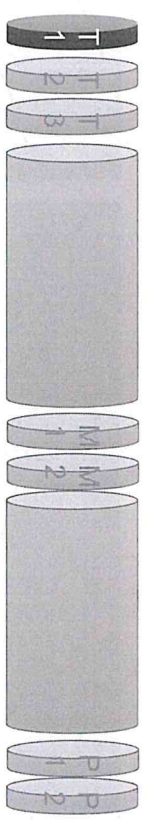
P2 - Niveau 10

MACROSTRUCTURE - PLAQUETTE T1

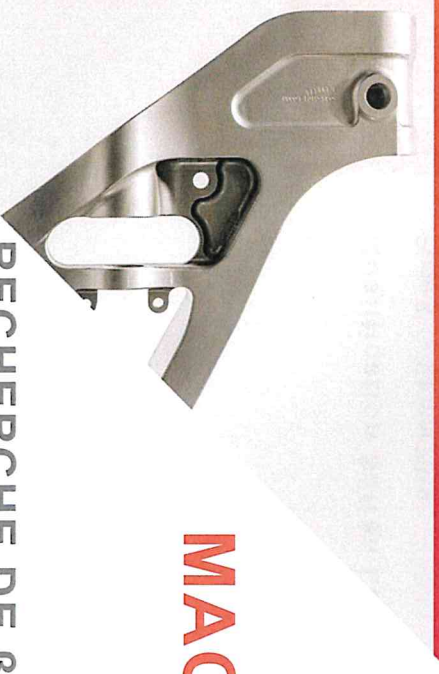
RECHERCHE DE β -FLECK - ACTX

970°C / 1H / AIR

Absence de β fleck



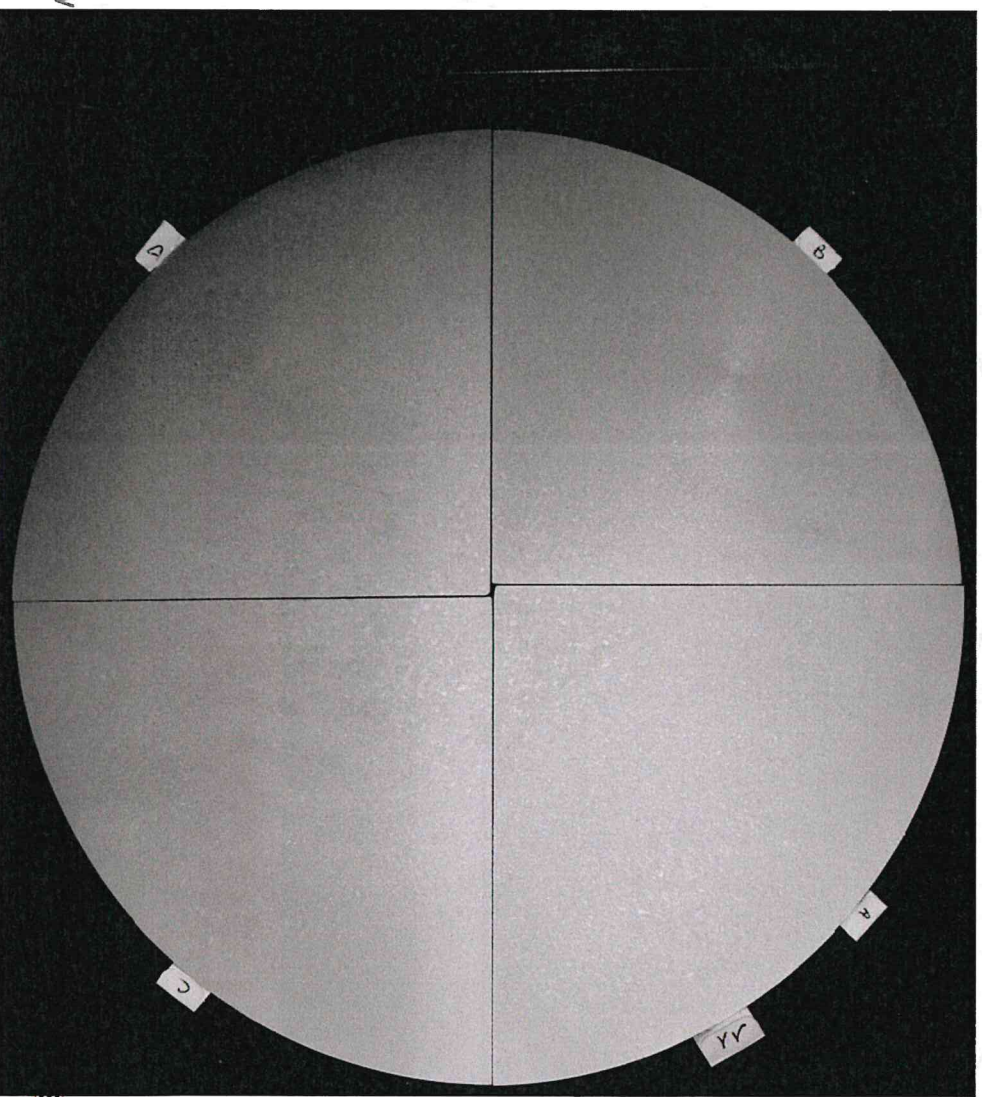
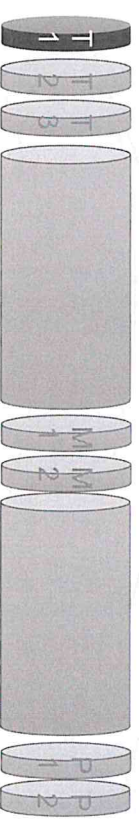
MACROSTRUCTURE - PLAQUETTE T1



RECHERCHE DE β -FLECK - AEAG

970°C / 1H / AIR

Absence de β fleck



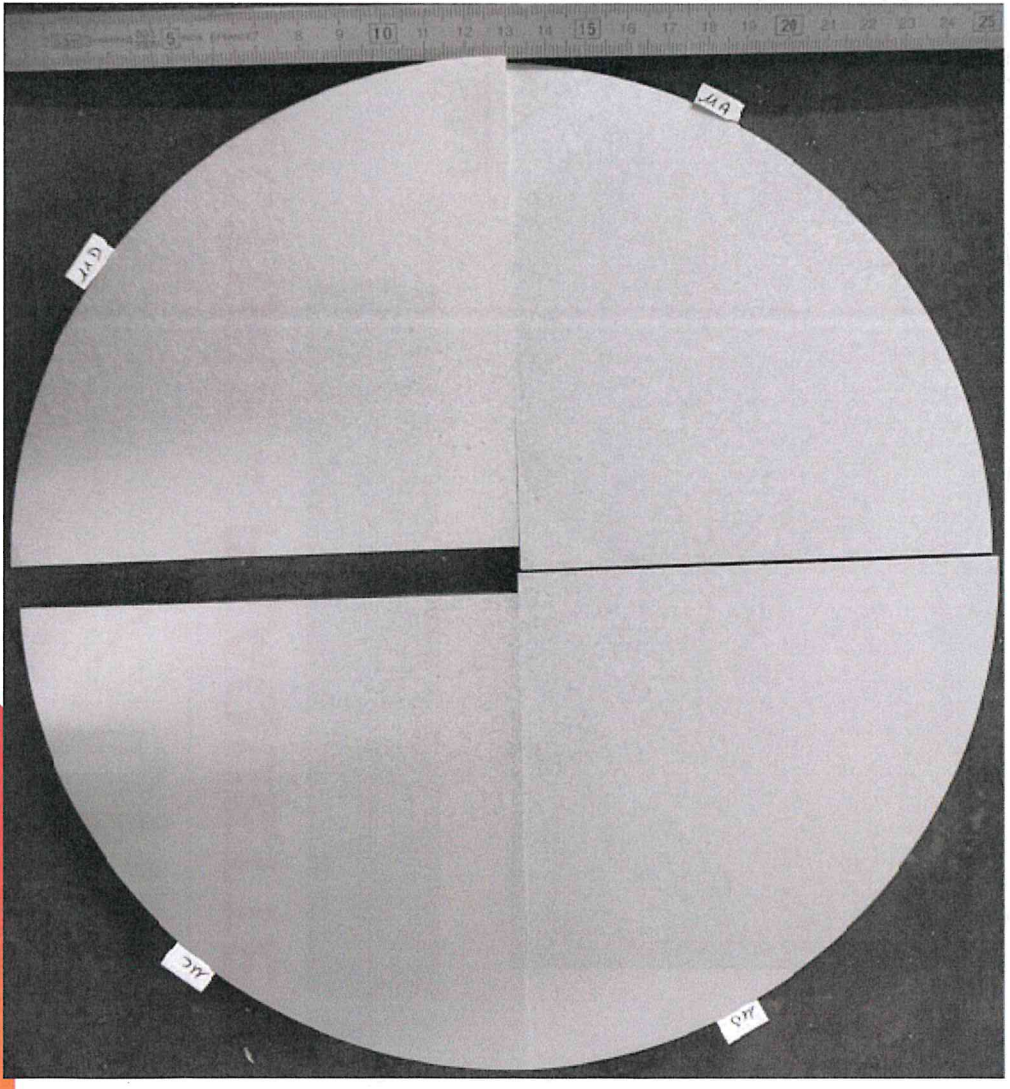
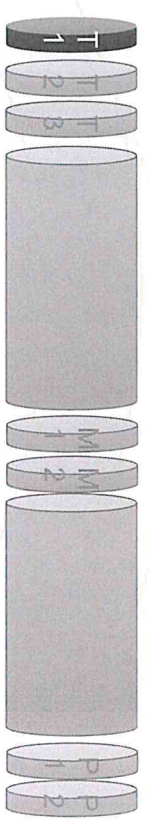
MACROSTRUCTURE - PLAQUETTE T1

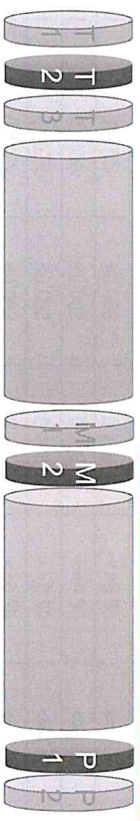


RECHERCHE DE β -FLECK - ADEB

970°C / 1H / AIR

Absence de β fleck



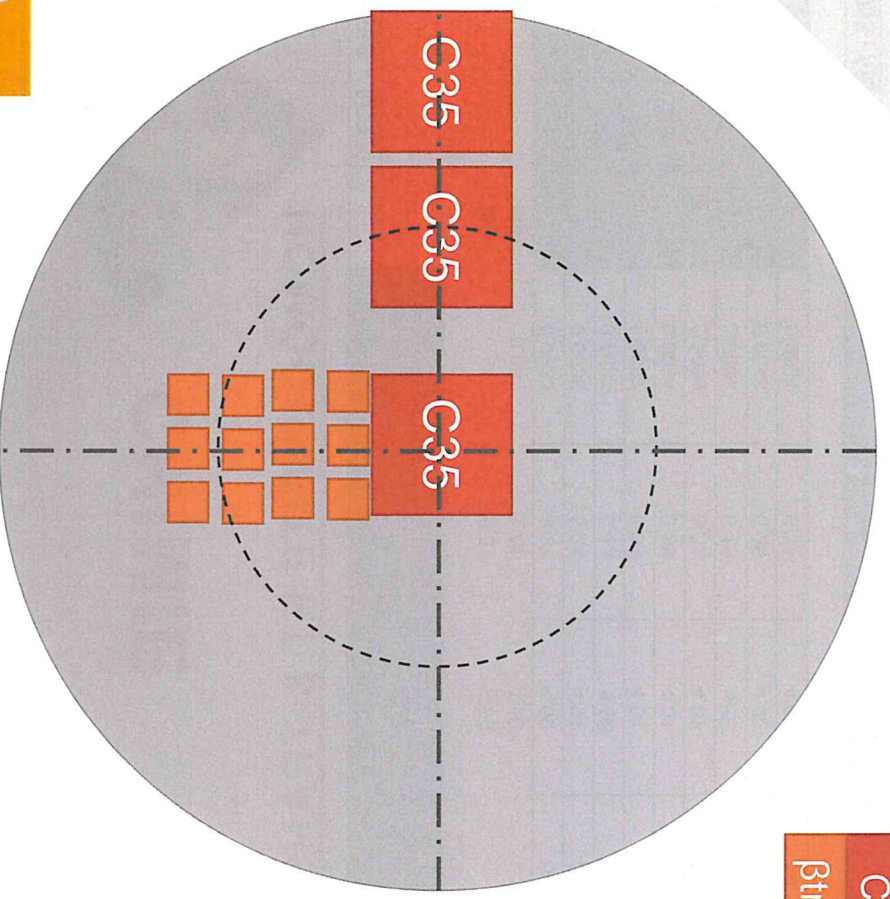


CHIMIE

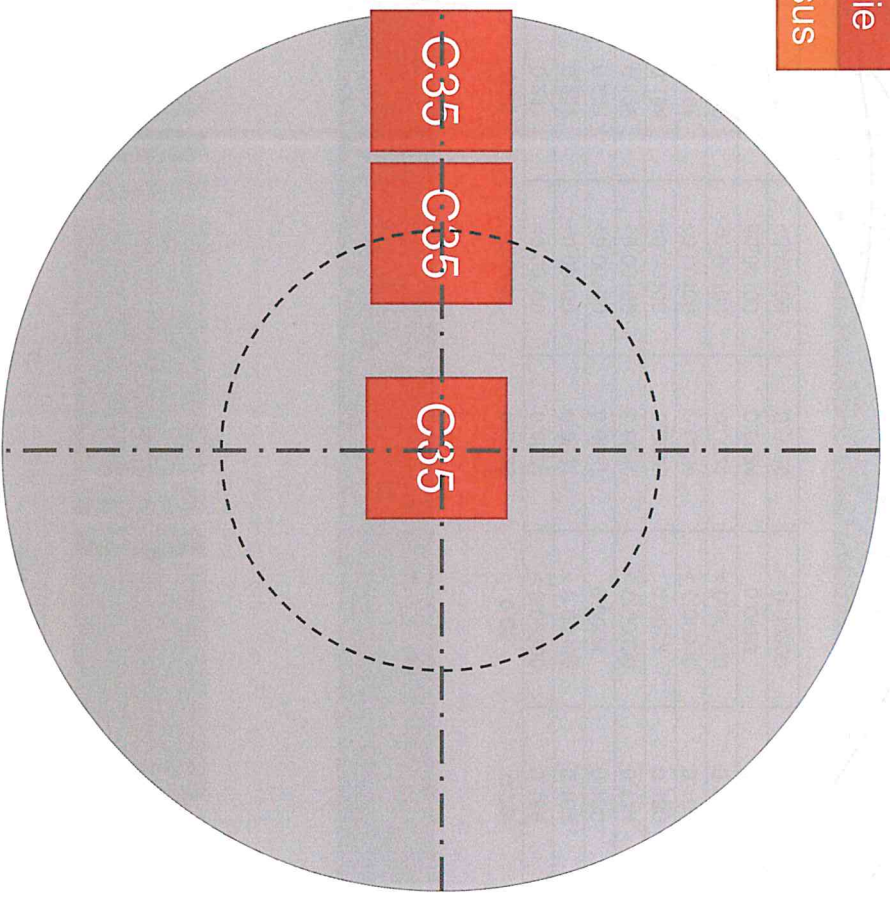
SCHEMA DES PRELEVEMENTS – T2/M2/P1



Chimie
Etrangers



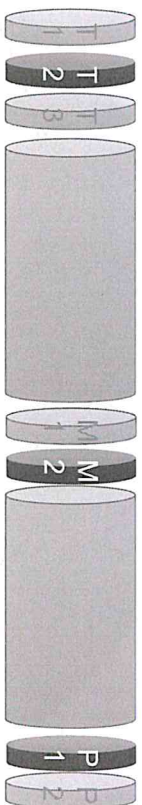
Prélèvements T2 et P1



Prélèvements M2



CHIMIE



UKAD

HOMOGENEITE ET β -TRANSUS

160208K05S - ACTX

	1	10	11	14	15	87	90	91	92
C	AI	V	Ti	Fe	Y	H2	N2	O2	
C_01R	TI10F	TI10F	TI10F	TI10F	TI10F	TI10F	TI01N	TI01N	TI01N

Tp (°C)

Min
Max

ET17-375-150	23X	C1	0.0032	6.27	4.00	89.5	0.211	<0.00100	0.0024	< 0.00300	0.159
	23X	M/R1	0.0038	6.24	4.01	89.5	0.217	<0.00100	0.0031	< 0.00300	0.162
	23X	PEAU	0.0037	6.15	3.96	89.6	0.211	<0.00100	0.0037	0.0034	0.180
	21	C1	0.0032	6.33	4.01	89.4	0.199	<0.00100	0.0020	< 0.00300	0.174
	21	M/R1	0.0034	6.35	4.01	89.4	0.194	<0.00100	0.0029	0.0032	0.180
	21	PEAU	0.0089	6.34	4.02	89.4	0.194	<0.00100	0.0034	< 0.00300	0.166
	11	C1	0.0037	6.19	4.05	89.5	0.189	<0.00100	0.0021	< 0.00300	0.181
	11	M/R1	0.0048	6.25	4.02	89.5	0.185	<0.00100	0.0024	0.0033	0.186
	11	PEAU	0.0031	6.31	4.01	89.5	0.182	<0.00100	0.0030	< 0.00300	0.187

170400K05S - AEAG

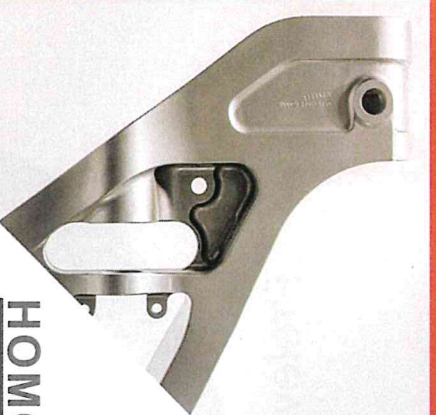
	C	AI	V	Ti	Fe	Y	H2	N2	O2	SUM	CHQ
	C_01R	TI10F	TI10F	TI10F	TI10F	TI10F	TI01N	TI01N	TI01N	TIQ11	TIQ11

Tp (°C)

Min
Max

ET19-169	22X	C1	0.0037	6.53	3.99	89.3	0.210	<0.001	0.0012	<0.003	0.172
	22X	M/R1	0.0038	6.5	3.98	89.3	0.208	<0.001	0.0025	<0.003	0.169
	22X	P1	0.004	6.42	3.95	89.4	0.209	<0.001	0.0025	<0.003	0.176
	13	C1	0.0052	6.57	4.02	89.2	0.202	<0.001	0.0022	<0.003	0.175
	13	M/R1	0.0045	6.56	4.00	89.3	0.201	<0.001	0.0027	<0.003	0.175
	13	P1	0.004	6.51	3.97	89.3	0.198	<0.001	0.0035	<0.003	0.18
	11	C1	0.0035	6.33	4.06	89.4	0.202	<0.001	0.0013	<0.003	0.186
	11	M/R1	0.0036	6.54	4.00	89.3	0.188	<0.001	0.0014	0.0031	0.188
	11	P1	0.0038	6.53	3.98	89.3	0.184	<0.001	0.0024	0.0031	0.191

Alliages



CHIMIE



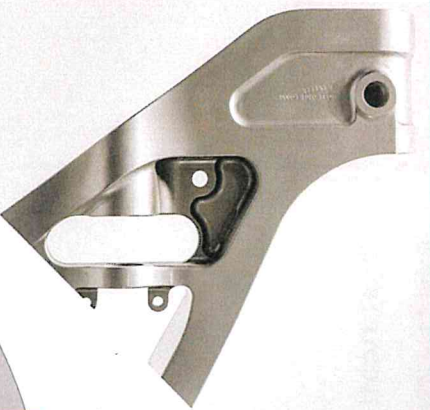
UKAD

HOMOGENEITE ET β -TRANSUS

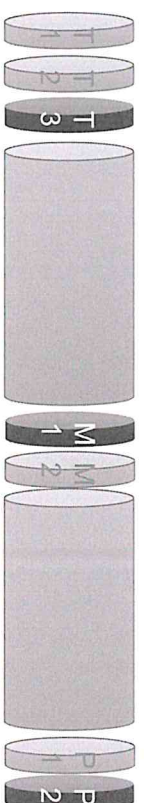
170036K05S - ADEB	C	Al	V	Ti	Fe	Y	H2	N2	O2	SUM	CHQ	T _B (°C)
	C _{01R}	TI10F	TI10F	TI10F	TI10F	TI10F	TI01N	TI01N	TI01N	TIQ11	TIQ11	

Min 5,5 3,5
Max 0,08 6,75 4,5

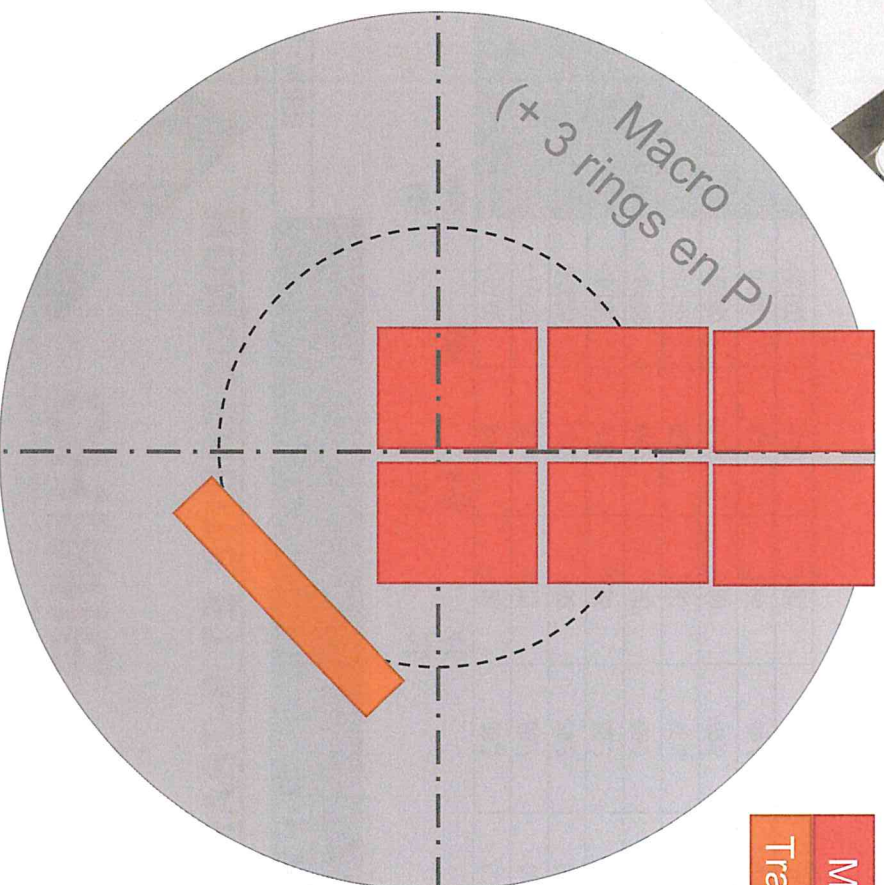
ET18-019	C1	6,47	3,94	89,3	0,211		0,0043	<0,003	0,163	<=0,40	<=0,10	995
	M/R1	6,34	4,22	89,2	0,178		0,006	0,003	0,167	<=0,40	<=0,10	995
	P1	6,42	3,92	89,3	0,216		0,0074	<0,003	0,163	<=0,40	<=0,10	
	C1	<0,002	6,53	89,3	0,205		0,0032	<0,003	0,169	<=0,40	<=0,10	
	M/R1	<0,002	6,52	89,3	0,202		0,0048	<0,003	0,169	<=0,40	<=0,10	
	P1	<0,002	6,52	89,3	0,195		0,0049	<0,003	0,176	<=0,40	<=0,10	
	C1	<0,002	6,29	89,5	0,199		0,0036	<0,003	0,174	<=0,40	<=0,10	1000
	M/R1	0,002	6,42	89,4	0,188		0,0051	0,003	0,185	<=0,40	<=0,10	1005
	P1	<0,002	6,53	89,3	0,18		0,0056	<0,003	0,182	<=0,40	<=0,10	



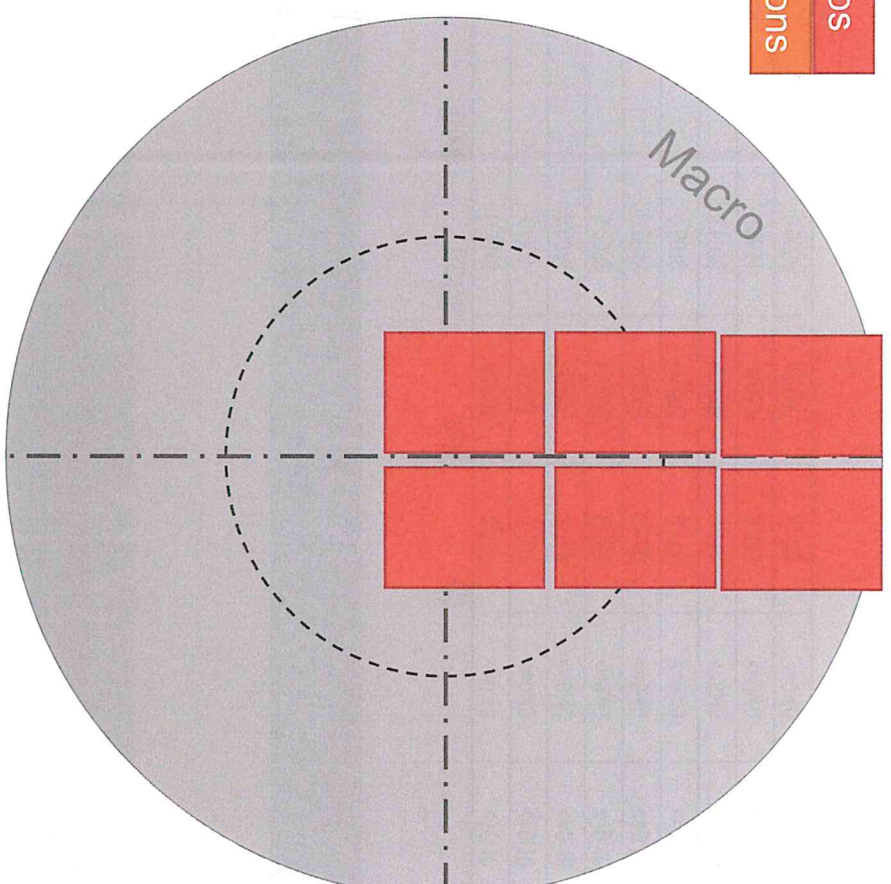
MICROSTRUCTURE



SCHEMA DES PRELEVEMENTS – T3/M1/P2



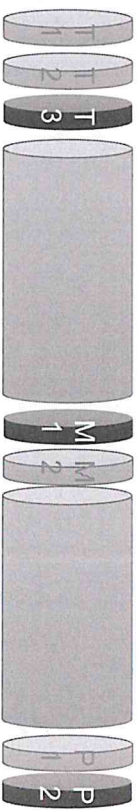
Micros
Tractions



Prélèvements T3 et P2

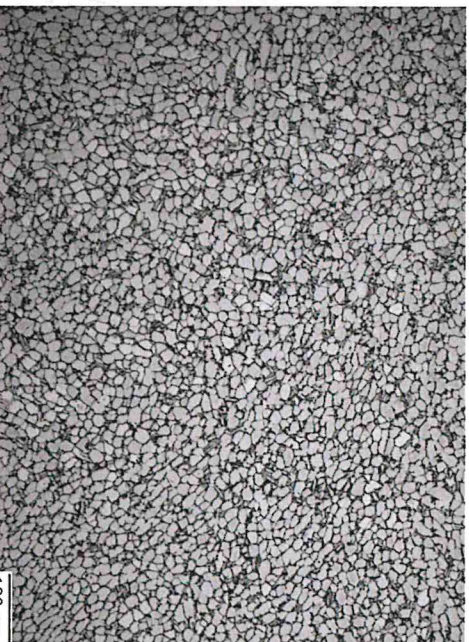
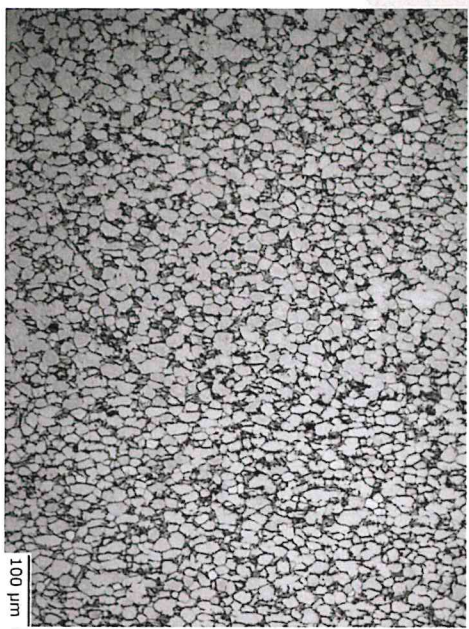
Prélèvements M1

MICROSTRUCTURE

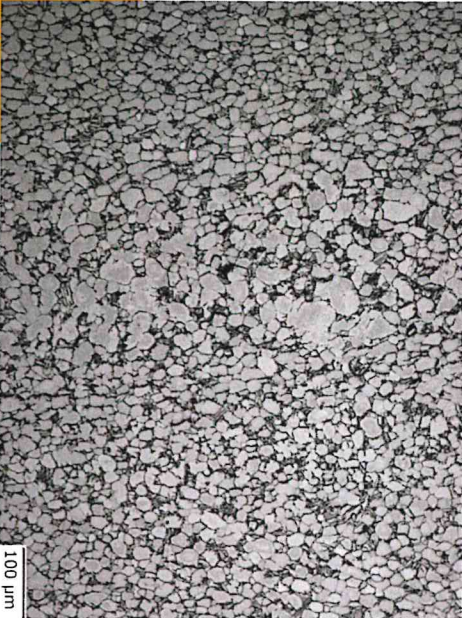
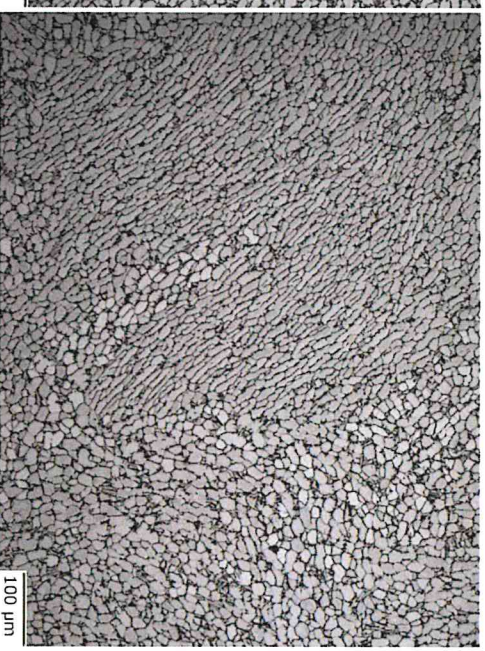


Structure majoritairement observée - ACTX

Sens long - G x 100

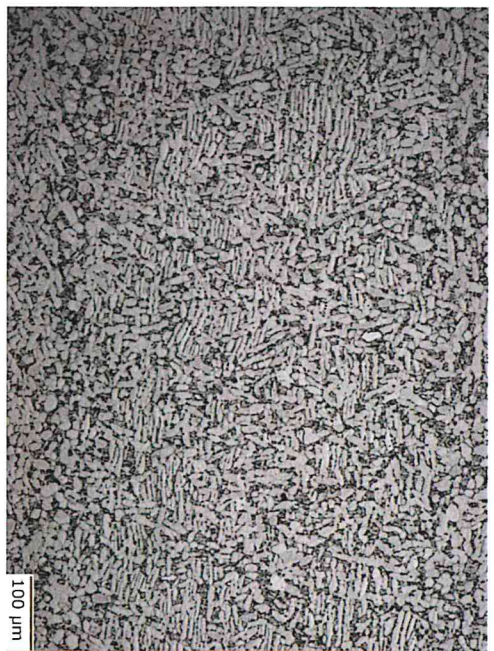


Sens travers - G x 100



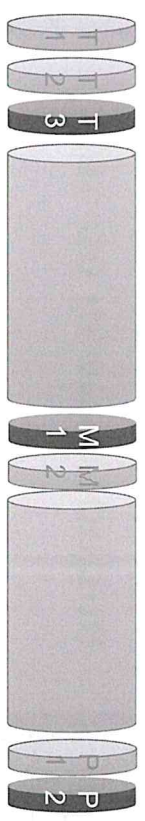
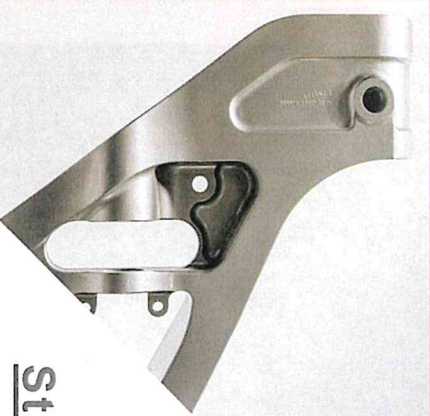
Alliages

Conforme AMS 2948
Pas de liserés continu
aux anciens joints de
grain beta



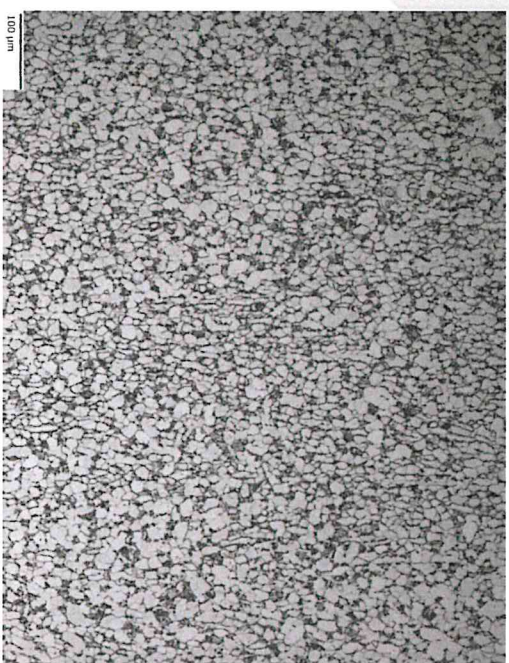
100 µm

MICROSTRUCTURE

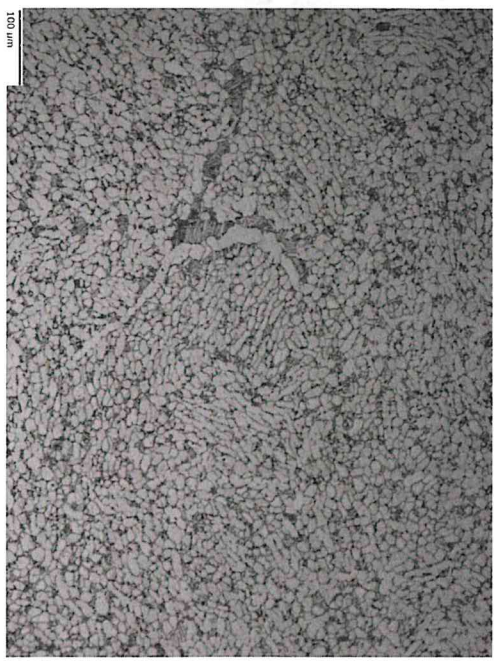
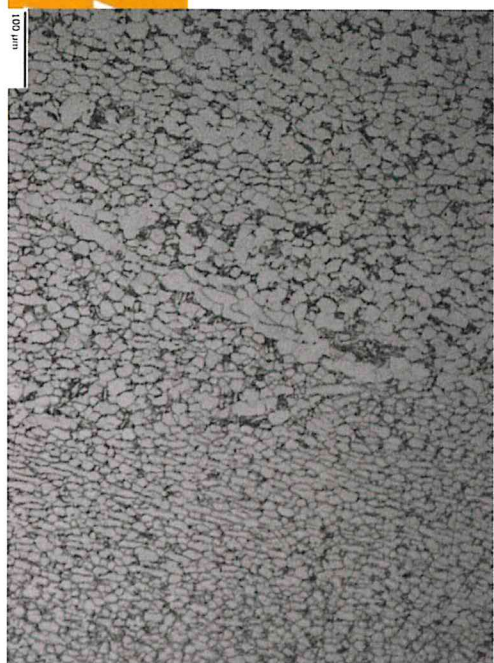
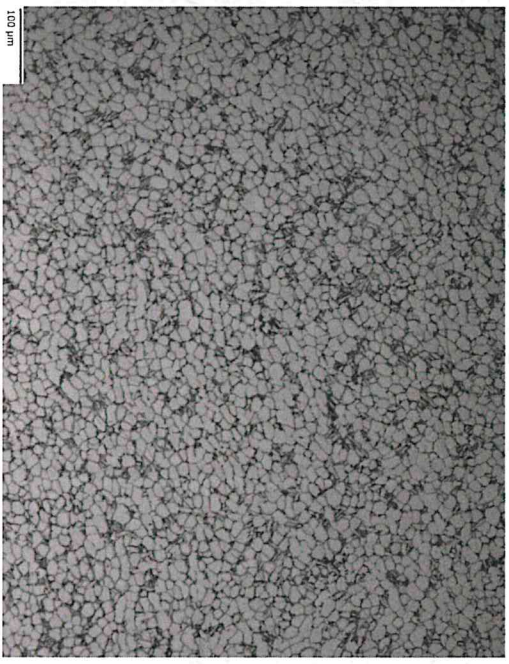


Structure majoritairement observée -AEAG

Sens long – G x 100



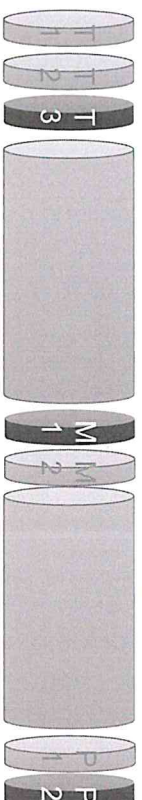
Sens travers – G x 100



Conforme AMS
2948

Pas de liserés
continu aux
anciens joints de
grain beta

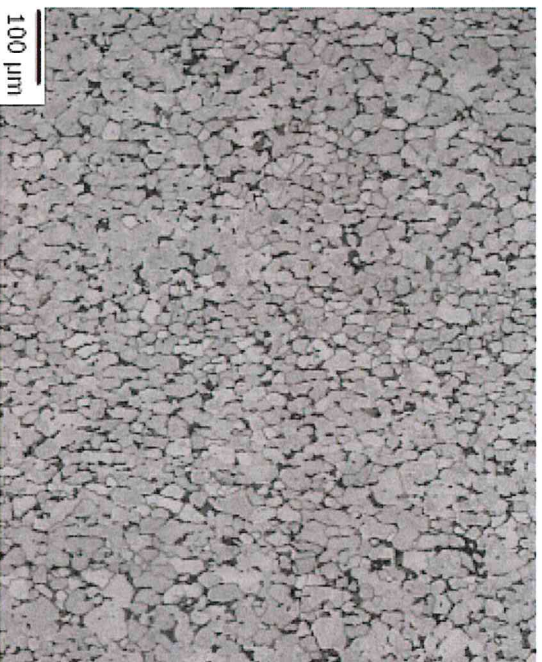
MICROSTRUCTURE



Structure majoritairement observée - ADEB

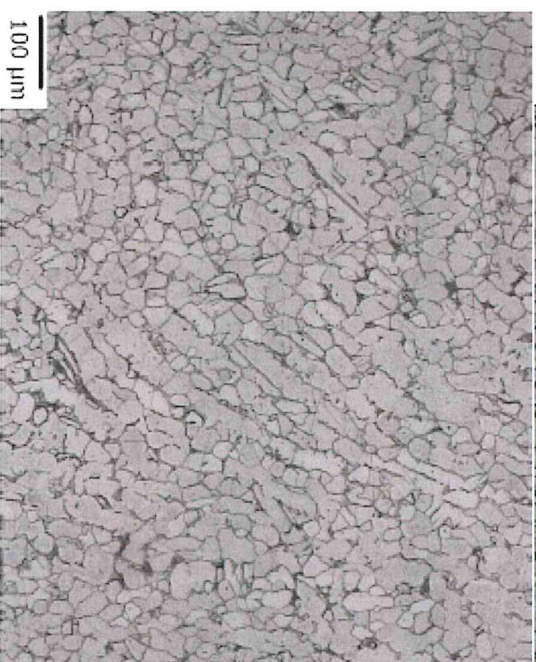
Sens long – G x 100

Sens travers – G x 100



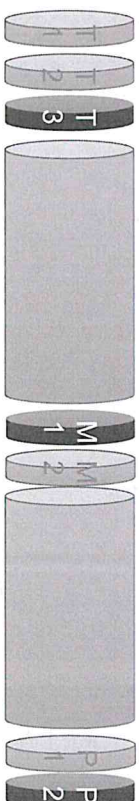
Conforme AMS 2948

Pas de liserés continu
aux anciens joints de
grain beta





TRACTIONS



UKAD

Comparatifs des coulées sélectionnées

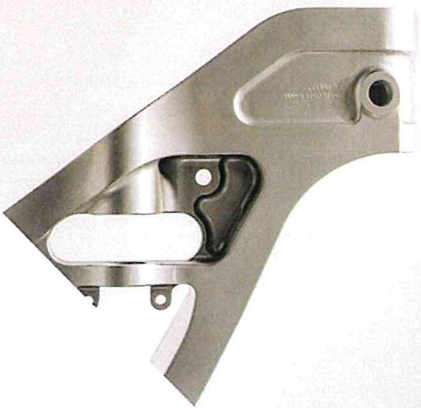
ACTX						
Repère	Rm (Mpa)	Rp0,2 (Mpa)	A4D (%)	ASD (%)	Z%	
11	920	840	15		23	
	925	850		14	22	
23X	915	830	15		26	
	910	830		16	21	
Imposition	≥896	≥830	≥10	≥10	≥20	

AEAG						
Repère	Rm (Mpa)	Rp0,2 (Mpa)	A4D (%)	A5D (%)	Z%	
11	920	845	14	13	28	
	930	850	14	12	27	
23X	915	840	16	14	36	
	910	835	15	13	30	
Imposition	≥896	≥830	≥10	≥10	≥20	

ADEB						
Repère	Rm (Mpa)	Rp0,2 (Mpa)	A4D (%)	A5D (%)	Z%	
11	912	826	16,5	17	26	
	907	833			32	

23X	925	854	17		31	
	921	841		15	25	
Imposition	≥896	≥830	≥10	≥10	≥20	

BILAN DES RESULTATS



Macrostructure

- Conforme AMS 2380 – Pas de ségrégations chimiques ni de micrographie non conforme dans les annulaires
- Absence de β Fleck

Chimie/Microstructure

- Chimie et beta transus conformes
- Conforme AMS 4928 : quelques aspects particuliers rencontrés sur AEAG mais qui ne présentent pas de réseau de liserés continus

Caractéristiques mécaniques

- Conformes
- 1 résultat légèrement inférieur à la limite basse

