PŘÍLOHA 1

Chemické složení slitiny pro výrobu odlitků před úpravou vtoku (varianta 1,2,3)

Meas.	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti
	%	%	%	%	%	%	%	%	%	%	%
	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Konc.	Typ. kor. konc	Konc.	Typ. kor. konc
1	7,34	0,144	0,0302	0,0198	0,384	0,0016	0,0039	0,0192	0,0023	0,0040	0,114
2	7,01	0,142	0,0306	0,0191	0,379	0,0017	0,0040	0,0200	0,0028	0,0058	0,116
3	7,29	0,143	0,0279	0,0187	0,372	0,0022	0,0039	0,0176	0,0023	0,0053	0,114
A. Min	6,50				0,250						
<x>	*7,21*	*0,143*	*0,0296*	*0,0192*	*0,378*	*0,0018*	*0,0039*	*0,0189*	*0,0025*	*0,0050*	*0,115*
A. Max	7,50	0,190	0,0500	0,1000	0,450	0,0300	0,0300	0,0700	0,0300	0,0300	0,250

Meas.	Sr	Ca	Sb	Bi	P	Na	Jine_Cel	Al			
	%	%	%	%	%	%	%	%			
	Typ. kor. konc	Typ. kor. konc	Konc.	Konc.	Typ. kor. konc	Konc.	Typ. kor. konc	Typ. kor. konc			
1	0,00087	0,00022	0,0026	<0,00100	<0,00050	0,00038	A 0,00000	91,9			
2	0,00055	0,00019	<0,0020	<0,00100	<0,00050	0,00031	A 0,00000	92,2			
3	0,00050	0,00076	<0,0020	<0,00100	<0,00050	0,0042	A 0,00000	92,0			
<x>	*0,00064*	*0,00039*	*0,0022*	*<0,00100*	*<0,00050*	*0,0016*	*A 0,00000*	*92,0*			
A. Max	0,0300	0,0300	0,0300	0,0300	0,0020		0,1000				

Chemické složení slitiny pro výrobu odlitků po úpravě vtoku (varianta 4)

Meas.	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti
	%	%	%	%	%	%	%	%	%	%	%
	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Typ. kor. konc	Konc.	Typ. kor. konc	Konc.	Typ. kor. konc
1	7,47	0,154	0,0304	0,0195	0,375	0,0019	0,0036	0,0199	0,0020	0,0059	0,119
2	7,37	0,159	0,0258	0,0200	0,382	0,0015	0,0034	0,0182	0,0015	0,0073	0,120
3	7,32	0,156	0,0262	0,0190	0,375	0,0018	0,0034	0,0188	0,0023	0,0056	0,118
A. Min	6,50				0,250						
<x>	*7,39*	*0,156*	*0,0274*	*0,0195*	*0,378*	*0,0017*	*0,0035*	*0,0189*	*0,0020*	*0,0063*	*0,119*
A. Max	7,50	0,190	0,0500	0,1000	0,450	0,0300	0,0300	0,0700	0,0300	0,0300	0,250

Meas.	Sr	Ca	Sb	Bi	P	Na	Jine_Cel	Al			
	%	%	%	%	%	%	%	%			
	Typ. kor. konc	Typ. kor. konc	Konc.	Konc.	Typ. kor. konc	Konc.	Typ. kor. konc	Typ. kor. konc			
1	0,00054	0,00040	<0,0020	<0,00100	<0,00050	0,00020	A 0,00000	91,8			
2	0,00043	0,00034	<0,0020	<0,00100	<0,00050	0,00013	A 0,00000	91,9			
3	0,00041	0,00049	<0,0020	<0,00100	<0,00050	0,00012	A 0,00000	91,9			
<x>	*0,00046*	*0,00041*	*<0,0020*	*<0,00100*	*<0,00050*	*0,00015*	*A 0,00000*	*91,9*			
A. Max	0,0300	0,0300	0,0300	0,0300	0,0020		0,1000				

PŘÍLOHA 2

Vzorky bez TZ				00X
Druh T5 (jen umělé stárnutí)			200°C/6hod.	01X = 200/6-X
			180°C/6hod.	02X = 180/6-X
			160°C/6hod.	03X = 160/6-X
Druh TZ	R.Ž.	540°C/4hod.	+ 180°C/4hod.	11X = 540/4+180/4-X
	R.Ž.	540°C/4hod.	+ 170°C/4hod.	12X = 540/4+170/4-X
	R.Ž.	540°C/4hod.	+ 160°C/4hod.	13X = 540/4+160/4-X
	R.Ž.	540°C/4hod.	+ 150°C/4hod.	14X = 540/4+150/4-X
	R.Ž.	540°C/4hod.	+ 190°C/4hod.	15X = 540/4+190/4-X
	R.Ž.	540°C/4hod.	+ 200°C/4hod.	16X = 540/4+200/4-X
	R.Ž.	500°C/4hod.	+ 180°C/4hod.	21X = 500/4+180/4-X
	R.Ž.	520°C/4hod.	+ 180°C/4hod.	22X = 520/4+180/4-X
	R.Ž.	550°C/4hod.	+ 180°C/4hod.	23X = 550/4+180/4-X
	R.Ž.	500°C/6hod.	+ 180°C/4hod.	24X = 500/6+180/4-X
	R.Ž.	550°C/2hod.	+ 180°C/4hod.	25X = 550/2+180/4-X
	R.Ž.	520°C/2hod.	+ 180°C/4hod.	26X = 520/2+180/4-X
	R.Ž.	540°C/2hod.	+ 180°C/4hod.	27X = 540/2+180/4-X
	R.Ž.	540°C/1hod.	+ 180°C/4hod.	28X = 540/1+180/4-X
	R.Ž.	550°C/1hod.	+ 180°C/4hod.	29X = 550/1+180/4-X
	R.Ž.	540°C/3hod.	+ 180°C/4hod.	210X = 540/3+180/4-X
	R.Ž.	530°C/3hod.	+ 180°C/4hod.	211X = 530/3+180/4-X
Vliv mazadla	R.Ž.	540°C/4hod.	+ 180°C/4hod.	30X (pouze druh odlitku 4)
Druh TZ	R.Ž.	540°C/4hod.	+ 180°C/2hod.	41X = 540/4+180/2-X
	R.Ž.	540°C/4hod.	+ 180°C/4hod.	42X = 11X = 540/4+180/4-X
	R.Ž.	540°C/4hod.	+ 180°C/6hod.	43X = 540/4+180/6-X
	R.Ž.	540°C/4hod.	+ 180°C/8hod.	44X = 540/4+180/8-X
	R.Ž.	540°C/4hod.	+ 180°C/13hod.(T7)	45X = 540/4+180/13-X
	R.Ž.	540°C/4hod.	+ 160°C/2hod.	46X = 540/4+160/2-X
	R.Ž.	540°C/4hod.	+ 200°C/2hod.	47X = 540/4+200/2-X
Pouze R.Ž.	R.Ž. 540°C/4hod. + přirozené stárnutí (T4)			51X = 540/4-X
Druh TZ	R.Ž.	540°C/4hod.	+ 190°C/2hod.	61X = 540/4+190/2-X
	R.Ž.	540°C/4hod.	+ 190°C/4hod.	62X = 15X = 540/4+190/4-X
	R.Ž.	540°C/4hod.	+ 190°C/3hod.	63X = 540/4+190/3-X
	R.Ž.	530°C/3hod.	+ 190°C/3hod.	71X = 530/3+190/3-X

* Místo X označuje o jakou variantu odlitku se jedná.

PŘÍLOHA 3

Etapa výroby odlitku	Zpracování	Počet puchýřů [ks]			
		Na vtoku	V odlitku	Celkem v odlitku	Celkem v sérii
1	RŽ 500°C 4 hodiny	34	1	35	376
	RŽ 520°C 4 hodiny	26	2	28	
	RŽ 540°C 4 hodiny	49	9	58	
	RŽ 550°C 4 hodiny	26	10	36	
	RŽ 500°C 6 hodin	45	1	46	
	RŽ 550°C 2 hodiny	31	2	33	
	RŽ 550°C 1 hodinu	25	5	30	
	RŽ 520°C 2 hodiny	3	0	3	
	RŽ 540°C 2 hodiny	27	2	29	
	RŽ 540°C 1 hodiny	14	3	17	
	RŽ 540°C 3 hodiny	38	3	41	
	RŽ 530°C 4 hodiny	17	3	20	
2	RŽ 500°C 4 hodiny	37	1	38	305
	RŽ 520°C 4 hodiny	35	3	38	
	RŽ 540°C 4 hodiny	13	2	15	
	RŽ 550°C 4 hodiny	67	2	69	
	RŽ 500°C 6 hodin	24	3	27	
	RŽ 550°C 2 hodiny	54	3	57	
	RŽ 550°C 1 hodinu	7	3	10	
	RŽ 520°C 2 hodiny	16	6	22	
	RŽ 540°C 2 hodiny	6	1	7	
	RŽ 540°C 1 hodiny	1	0	1	
	RŽ 540°C 3 hodiny	12	1	13	
	RŽ 530°C 4 hodiny	6	2	8	
3	RŽ 500°C 4 hodiny	22	1	23	210
	RŽ 520°C 4 hodiny	16	2	18	
	RŽ 540°C 4 hodiny	29	1	30	
	RŽ 550°C 4 hodiny	30	4	34	
	RŽ 500°C 6 hodin	10	1	11	
	RŽ 550°C 2 hodiny	19	3	22	
	RŽ 550°C 1 hodinu	21	1	22	
	RŽ 520°C 2 hodiny	2	0	2	
	RŽ 540°C 2 hodiny	2	0	2	
	RŽ 540°C 1 hodiny	15	0	15	
	RŽ 540°C 3 hodiny	11	3	14	
	RŽ 530°C 4 hodiny	16	1	17	
4	RŽ 500°C 4 hodiny	16	3	19	162
	RŽ 520°C 4 hodiny	11	1	12	
	RŽ 540°C 4 hodiny	19	1	20	
	RŽ 550°C 4 hodiny	31	6	37	
	RŽ 500°C 6 hodin	8	2	10	
	RŽ 550°C 2 hodiny	8	1	9	
	RŽ 550°C 1 hodinu	6	1	7	
	RŽ 520°C 2 hodiny	8	1	9	
	RŽ 540°C 2 hodiny	19	2	21	
	RŽ 540°C 1 hodiny	10	0	10	
	RŽ 540°C 3 hodiny	5	1	6	
	RŽ 530°C 4 hodiny	2	0	2	

PŘÍLOHA 4

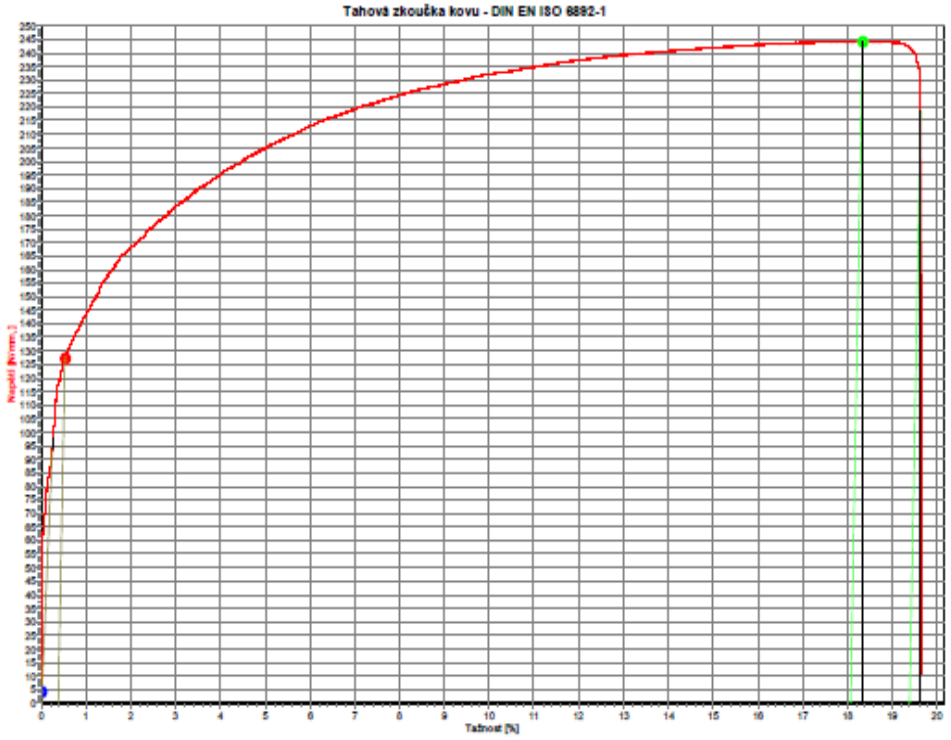
Vzorek	**E** [Gpa]	**F_{px2}** [N] [N]	**R_{px2}** [MPa]	**R_m** [MPa]	**A_g** [%]	**A** [%] [%]
001	77,452	2509,4	100	184	3,93	4,17
002	2,734	4536,1	138	182	2,38	7,03
003	6,89	3620,7	114	203	13,86	14,55
0041	6,596	4359,7	137	213	6,22	6,51
0042	6,85	3210,1	125	219	9,05	9,55
540/4+180/4-1	7,358	6310,2	211	306	14,31	19,63
540/4+180/4-2	16,731	5316,5	177	240	4,96	6,74
540/4+180/4-3	26,921	5552,9	174	272	13,22	18,08
540/4+180/4-4	4,955	4786,3	148	251	20,3	27,94
540/4+170/4-1	73,468	4129,6	158	259	9,81	10,67
540/4+170/4-2	63,295	5071,3	156	203	2,19	2,97
540/4+170/4-3	4,56	5549	170	251	8,79	11,52
540/4+170/4-4	68,112	3829,8	115	257	9,78	10,06
540/4+160/4-1	45,275	4317,9	139	241	9,66	11,95
540/4+160/4-2	78,654	4600,2	141	227	6,94	7,83
540/4+160/4-3	24,335	4340,8	151	222	8,67	10,36
540/4+150/4-1	10,701	5679,3	176	270	14,89	21,14
540/4+150/4-2	39,571	4123,6	127	244	17,72	19,65
540/4+150/4-3	16,572	4392,8	142	250	14,51	15,59
540/4+190/4-1	6,321	6520,3	204	284	5,32	6,06
540/4+190/4-2	54,114	5148	161	261	7,05	7,84
540/4+190/4-3	14,549	6457,4	202	277	11,47	16,35
540/4+190/4-4	45,663	5486,1	171	252	5,94	8,19
540/4+200/4-1	51,898	7329	228	283	4,48	4,7
540/4+200/4-2	38,415	7096,5	220	275	4,09	4,66
540/4+200/4-3	7,376	7030,3	218	293	11,31	18,23
540/4+200/4-4	10,342	6349,1	194	288	8,23	8,81
500/4+180/4-1	13,758	4955,5	154	249	14,09	17,75
500/4+180/4-2	14,599	3947,1	123	219	14,38	13,57
500/4+180/4-3	14,493	4862,5	148	233	8,89	9,62
500/4+180/4-4	45,749	4867,4	149	253	16,64	20,31
520/4+180/4-1	27,406	5412,9	169	259	13,98	18,48
520/4+180/4-2	7,538	5205,6	161	249	9,87	11,3
520/4+180/4-3	6,124	4420,4	139	233	14,54	17,42
520/4+180/4-4	55,662	3475,5	114	255	13,26	17,51

Vzorek	**E** [Gpa]	$\mathbf{F_{px2}}$ [N] [N]	$\mathbf{R_{px2}}$ [MPa]	$\mathbf{R_m}$ [MPa]	$\mathbf{A_g}$ [%]	**A** [%] [%]
550/4+180/4-1	10,955	5580,9	189	234	2,95	3,19
550/4+180/4-2	6,611	5081,9	181	256	6,33	7,99
550/4+180/4-3	8,258	5329,8	165	215	3,08	5,22
550/4+180/4-4	7,831	4790,8	157	249	6,23	9,95
500/6+180/4-1	6,79	5596,8	174	247	9,61	12,99
500/6+180/4-2	9,222	4588,9	144	168	1,28	3,34
500/6+180/4-3	17,331	4633,2	145	172	0,77	1,05
500/6+180/4-4	37,983	4022,1	132	242	11,16	12,84
550/2+180/4-1	28,858	5519,1	177	272	9,56	10,21
550/2+180/4-2	5,536	4479,5	183	251	5,75	6,39
550/2+180/4-3	71,731	5113,6	178	272	17,13	20,9
550/2+180/4-4	14,842	3143,9	156	254	16,4	22,68
520/2+180/4-1	22,291	4756,9	151	241	7,78	7,94
520/2+180/4-2	20,985	3906,1	126	217	10,36	11,4
520/2+180/4-3	30,428	4478,4	141	237	8,22	9,27
520/2+180/4-4	17,001	4555	140	231	6,78	7,63
540/2+180/4-1	57,991	4513,4	143	270	14,55	15,9
540/2+180/4-2	14,377	5009,1	150	244	12,12	13,09
540/2+180/4-3	6,816	5011,3	160	216	2,89	2,99
540/2+180/4-4	5,694	4911,2	154	258	15,46	20,97
540/1+180/4-1	4,554	4994,4	159	258	12,16	13,82
540/1+180/4-2	4,397	4115,1	129	206	12,07	15,48
540/1+180/4-3	4,891	5108,2	160	250	9,38	10,08
540/1+180/4-4	9,448	4675,9	146	241	9,32	10,46
550/1+180/4-1	20,202	1152,8	36	139	0,55	1,03
550/1+180/4-2	3,231	4247,5	136	226	9,55	10,5
550/1+180/4-3	6,218	5001,5	159	235	4,69	5,69
550/1+180/4-4	3,896	4952,8	154	244	9,76	15,97
301	27,812	5235,6	162	268	16,12	19,17
302	13,613	5481,3	173	266	11,89	15,55
303	21,359	5639,4	177	278	12,08	13,51
304	6,659	5362	166	264	15,85	20,87
540/4+180/2-1	10,91	4623,4	148	254	17,58	19,99
540/4+180/2-2	9,966	4603,1	148	2501	15,99	19,19
540/4+180/2-3	10,394	4969,7	156	259	14,05	15,53
540/4+180/2-4	35,546	4649,7	148	223	5,06	5,15

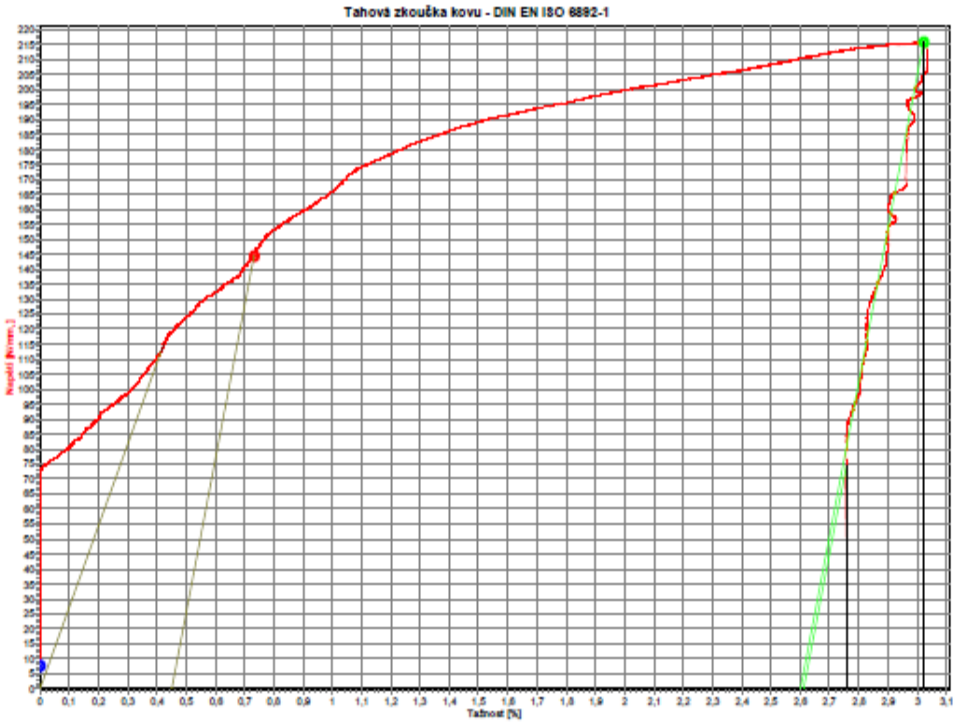
Vzorek	**E** [Gpa]	$\mathbf{F_{px2}}$ [N] [N]	$\mathbf{R_{px2}}$ [MPa]	$\mathbf{R_m}$ [MPa]	$\mathbf{A_g}$ [%]	**A** [%] [%]
540/4+180/6-1	47,072	5503,2	173	236	0,46	0,48
540/4+180/6-2	22,282	5954	190	278	11,33	15,09
540/4+180/6-3	13,86	6473,8	205	271	9,37	10,97
540/4+180/6-4	39,221	6288,4	197	304	12,44	15,63
540/4+180/8-2	71,696	5274,5	209	293	11,71	16,27
540/4+180/8-4	34,513	6159,8	193	239	1,09	1,17
540/4+180/13-1	28,659	8481,3	268	297	1,35	1,53
540/4+180/13-2	42,178	7520	236	290	3,97	4,34
540/4+180/13-3	72,793	7898,1	245	269	0,78	1,15
540/4+180/13-4	45,035	7337,2	228	308	8,84	9,33
540/4+160/2-1	14,745	4555,5	143	254	13,56	15,49
540/4+160/2-2	39,654	4346,5	138	248	8,27	8,74
540/4+160/2-4	35,339	6008,8	189	250	12,5	13,12
540/4+200/2-1	94,853	5134,4	164	256	16,6	21,21
540/4+200/2-2	5,184	5622,5	180	255	15,79	18,61
540/4+200/2-3	6,878	6264,8	199	244	2,77	4,96
540/4+200/2-4	20,723	5522,9	175	207	1,4	3,42
540/4-1	56,526	4840,6	151	209	3,49	5,98
540/4-2	12,949	4492,6	143	237	8,76	10,95
540/4-3	5,882	4839	156	247	13,77	16,73
540/4-4	12,256	5167,3	163	267	10,34	11,09
540/4+190/2-1	49,161	7928,2	247	305	7,37	9,2
540/4+190/2-2	49,402	7752	242	303	7,38	8,16
540/4+190/2-3	5,097	7993,8	249	265	0,86	4
540/4+190/2-4	8,901	8065,5	256	326	6,02	6,62
540/4+190/3-1	27,181	3630,3	145	216	2,22	2,52
540/4+190/3-2	6,853	5288,2	162	255	16,79	21,59
540/4+190/3-3	13,474	5404,7	168	261	16,57	23,94
540/4+190/3-4	15,996	5172,7	160	264	15,95	21,56
530/3+190/3-1	13,444	5406,4	170	267	6,54	7,22
530/3+190/3-2	38,13	4722,4	148	238	7,72	8,06
530/3+190/3-3	13,031	5305,1	165	247	10,29	11,18
530/3+190/3-4	11,58	5369,7	169	253	11,65	12,64
540/3+180/4-1	17,001	5685,7	181	261	5,86	7,68
540/3+180/4-2	7,362	4932,3	163	211	2,06	4,68
540/3+180/4-3	87,482	5134,7	164	218	2,55	4,36
540/3+180/4-4	7,304	5532	174	228	2,69	3,92

Vzorek	**E** [Gpa]	$\mathbf{F_{px2}}$ [N] [N]	$\mathbf{R_{px2}}$ [MPa]	$\mathbf{R_m}$ [MPa]	$\mathbf{A_g}$ [%]	**A** [%] [%]
530/3+180/4-1	23,619	6169,4	192	257	4,13	4,49
530/3+180/4-2	8,519	5003,9	157	252	10,66	12,71
530/3+180/4-3	2,869	6027,2	188	233	3,61	8,53
530/3+180/4-4	15,791	5292,3	167	239	9,65	10,41

PŘÍLOHA 5



Obr. 1 Vyhovující tvar tahového diagramu.



Obr. 2 Nevyhovující tvar tahového diagramu.

PŘÍLOHA 6

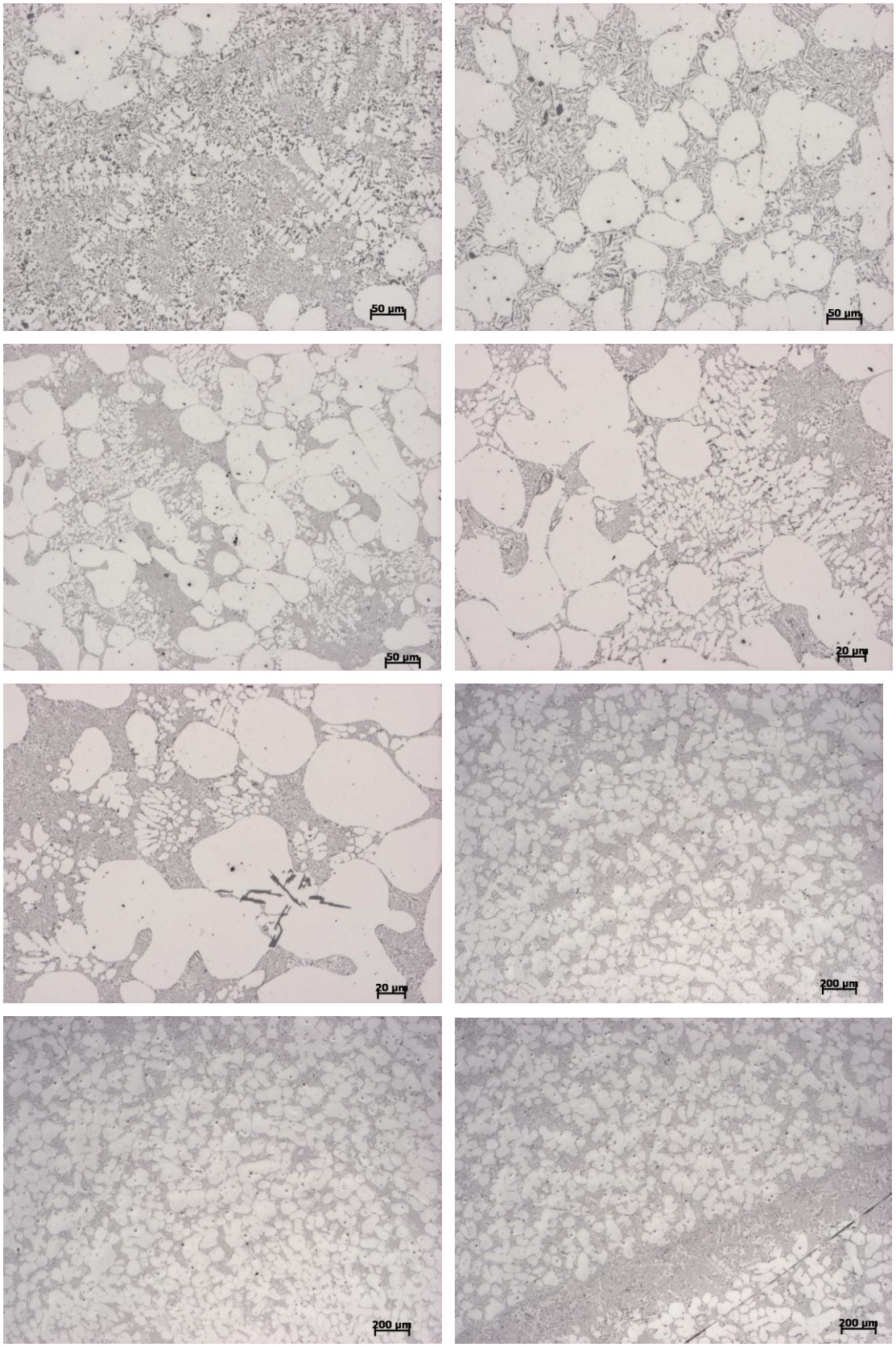
Naměřené hodnoty		**Vypočtená hodnota**
tvrdost [HBW]	**R_m** [MPa]	**R_m=k*HB** [MPa]
54	184	200
54	182	200
51	203	189
54	213	200
53	219	196
84	306	311
69	240	255
76	272	281
65	251	241
72	259	266
65	203	241
64	251	237
66	257	244
65	241	241
61	227	226
61	222	226
74	270	274
61	244	226
57	250	211
82	284	303
71	261	263
80	277	296
76	252	281
81	283	300
76	275	281
88	293	326
83	288	307
64	249	237
52	219	192
66	233	244
62	253	229
67	259	248
62	249	229
56	233	207
61	255	226
80	234	296
73	256	270
68	215	252
64	172	237
55	242	204
75	272	278
72	251	266
65	272	241

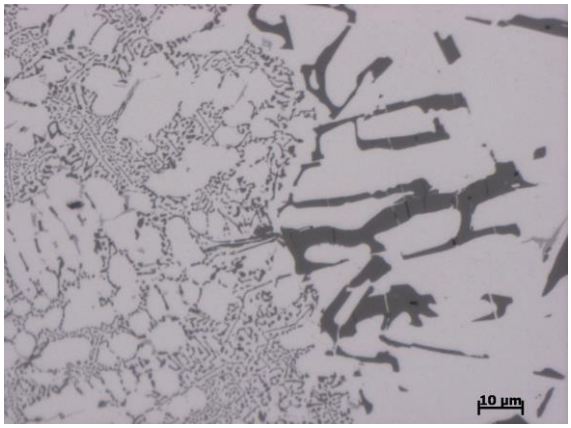
Naměřené hodnoty		**Vypočtená hodnota**
tvrdost [HBW]	**R_m** [MPa]	**R_m=k*HB** [MPa]
67	254	248
66	241	244
58	217	215
61	237	226
59	231	218
62	270	229
64	244	237
68	216	252
65	258	241
63	258	233
51	206	189
73	250	270
59	241	218
61	139	226
65	226	241
66	235	244
65	244	241
79	261	292
71	211	263
69	218	255
68	228	252
66	257	244
64	252	237
68	233	252
70	239	259
72	268	266
67	266	248
73	278	270
73	264	270
64	254	237
59	251	218
65	259	241
69	223	255
83	271	307
76	304	281
84	293	311
86	239	318
94	297	348
88	290	326
93	269	344
90	308	333
64	254	237
60	248	222
63	250	233

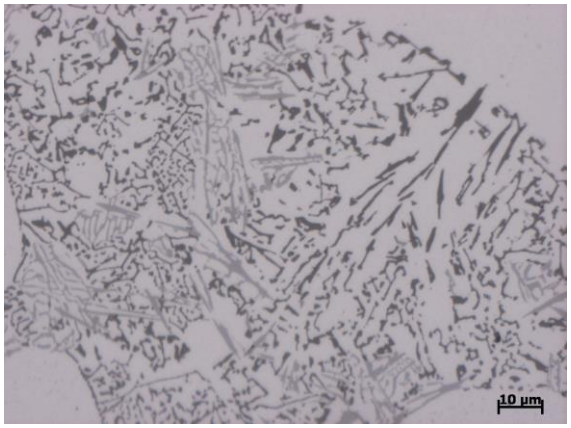
Naměřené hodnoty		**Vypočtená hodnota**
tvrdost [HBW]	**R_m** [MPa]	**R_m=k*HB** [MPa]
69	256	255
60	255	222
70	244	259
63	207	233
67	209	248
60	237	222
68	247	252
68	267	252
81	305	300
78	303	289
85	265	315
90	326	333
70	216	259
68	255	252
70	261	259
69	264	255
69	267	255
64	238	237
64	247	237
65	253	241
67	249	248
65	247	241
83	236	307
72	278	266

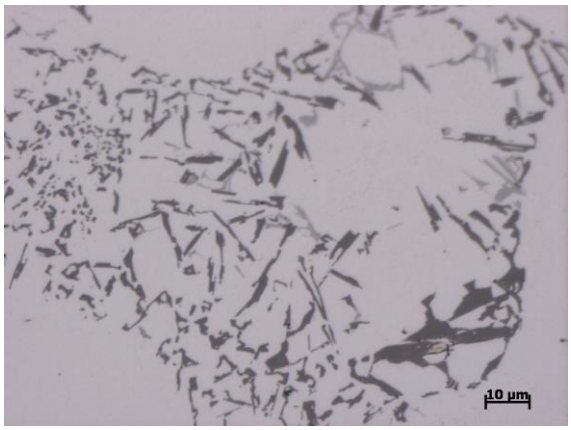
PŘÍLOHA 7

Vzorek 001 bez TZ

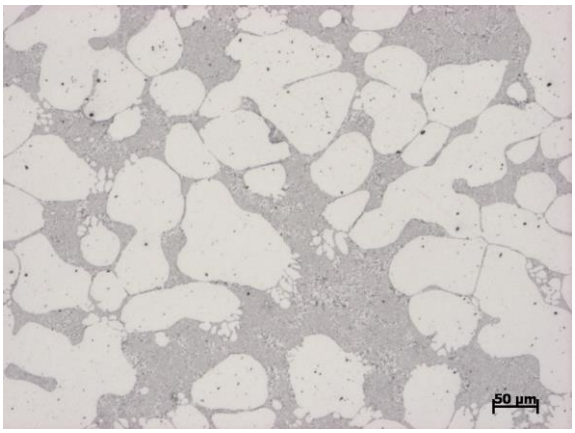


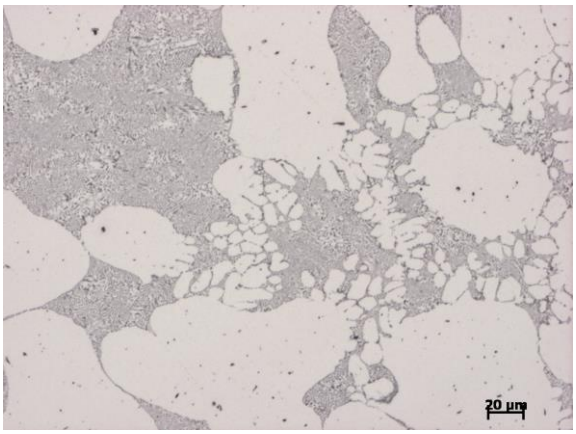


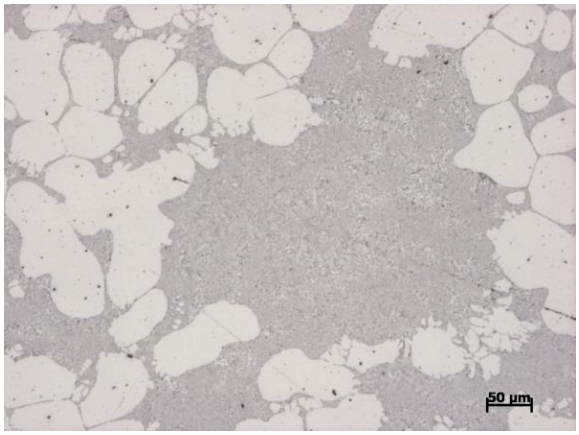


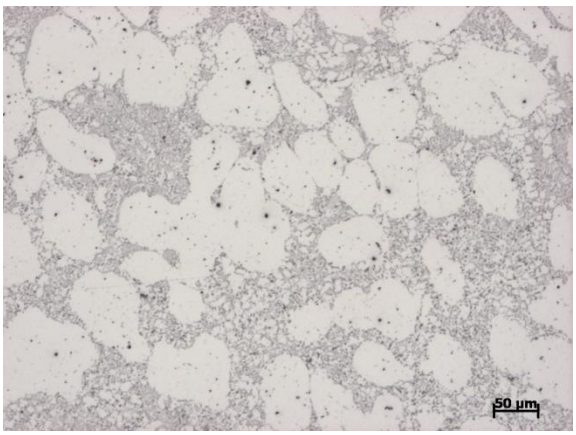


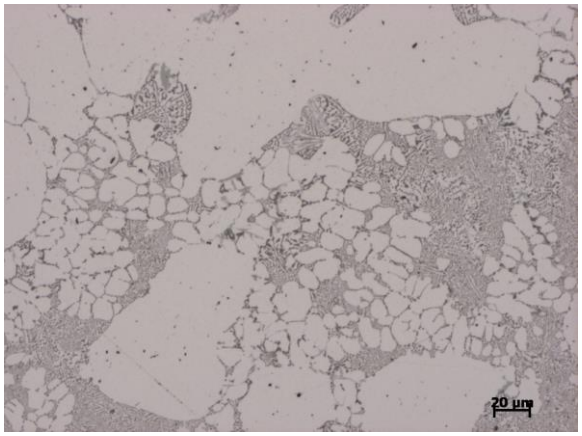
Vzorek 0041 bez TZ







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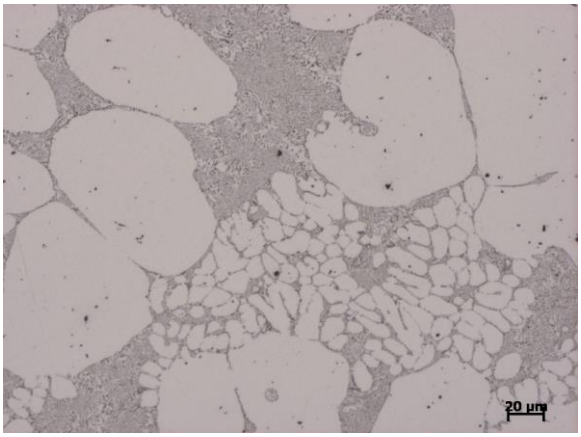
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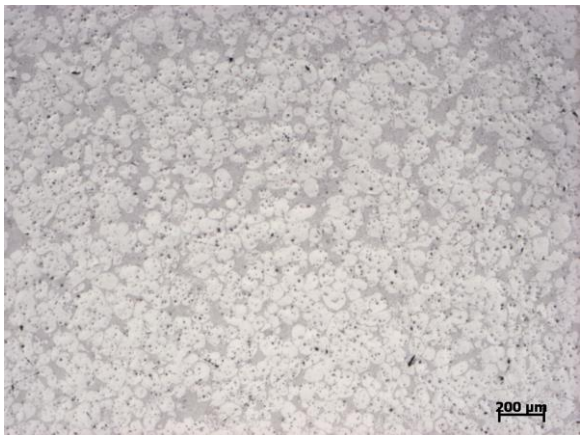
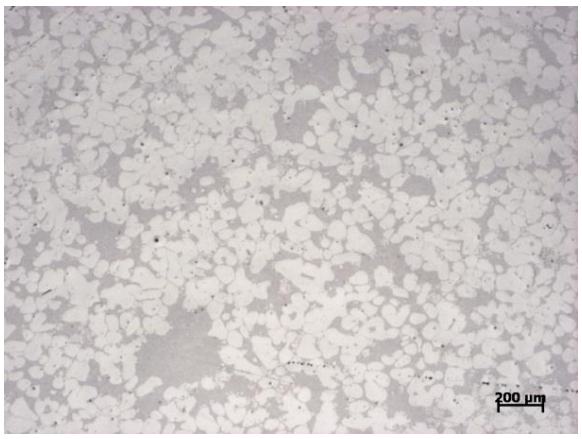

200 µm

200 µm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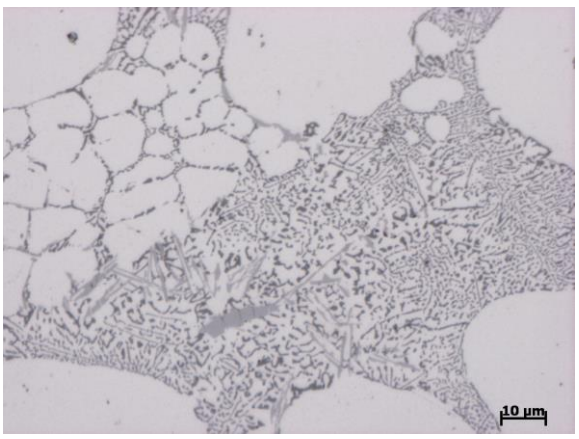
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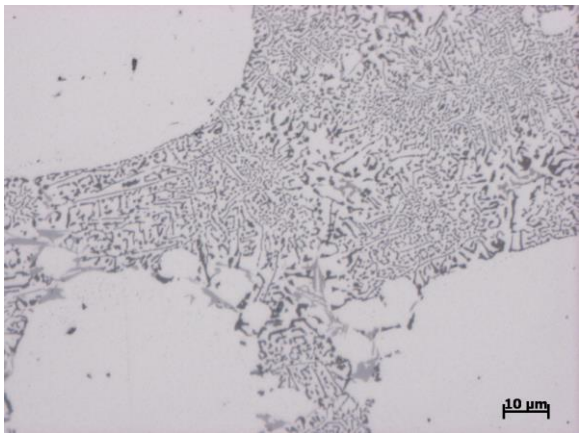
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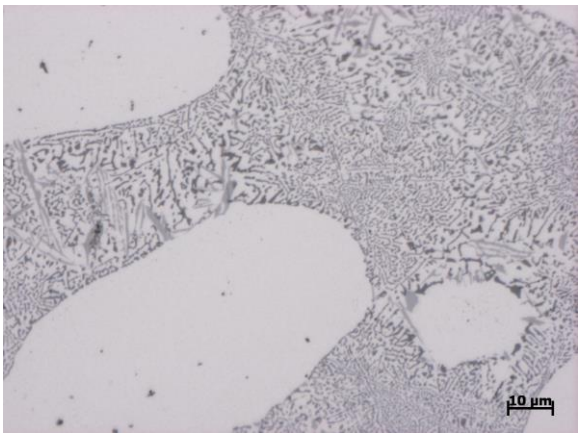
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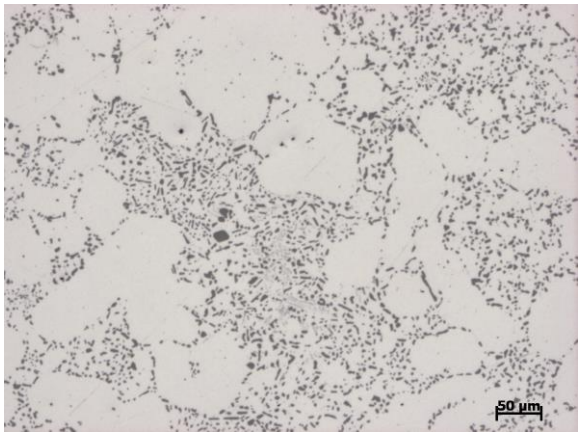
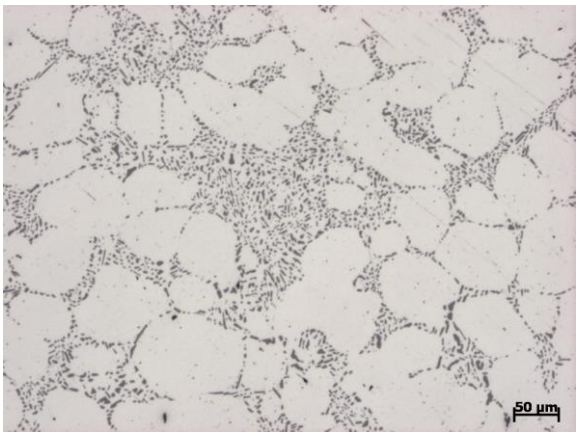
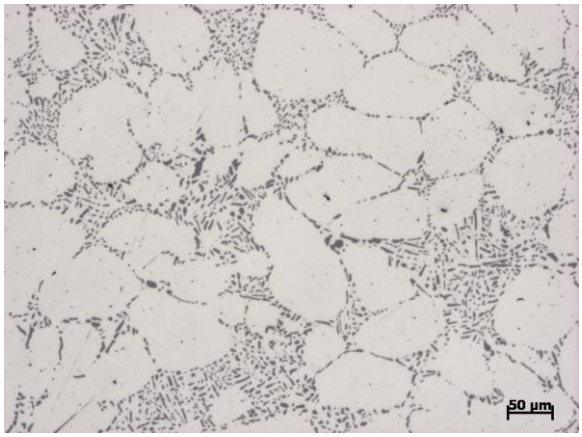
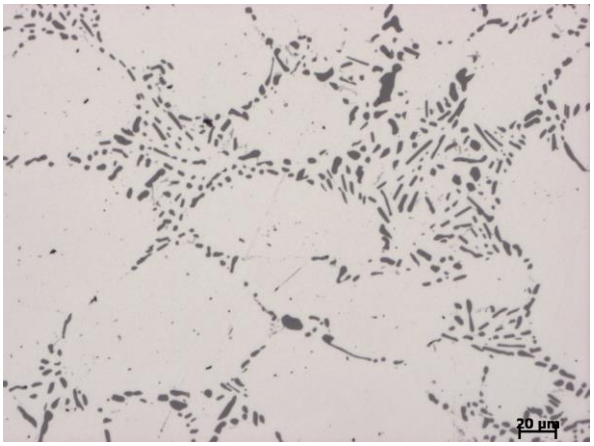
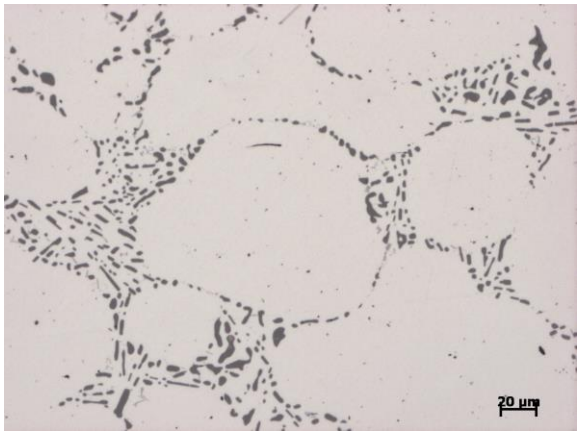
Vzorek 540/4+150/4

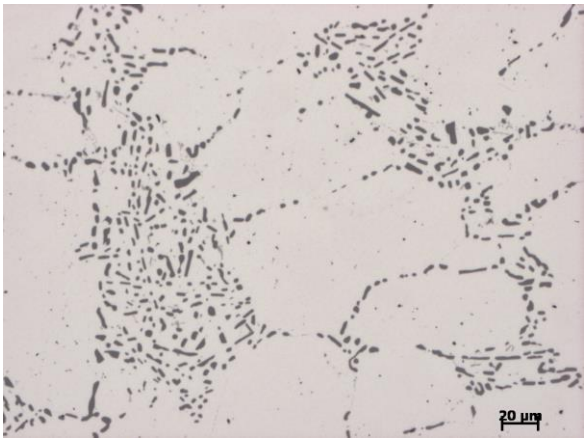


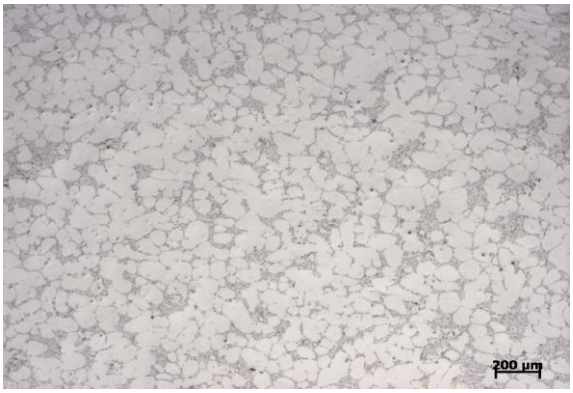


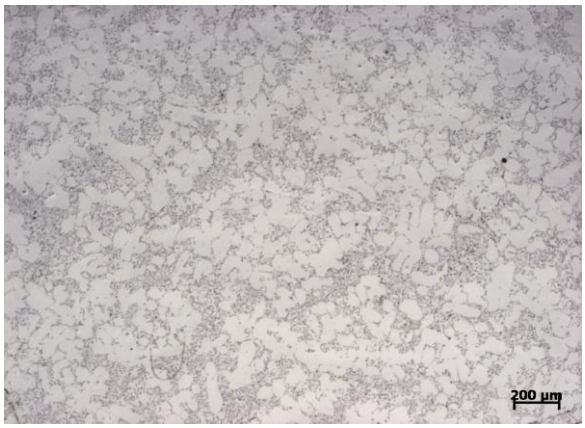


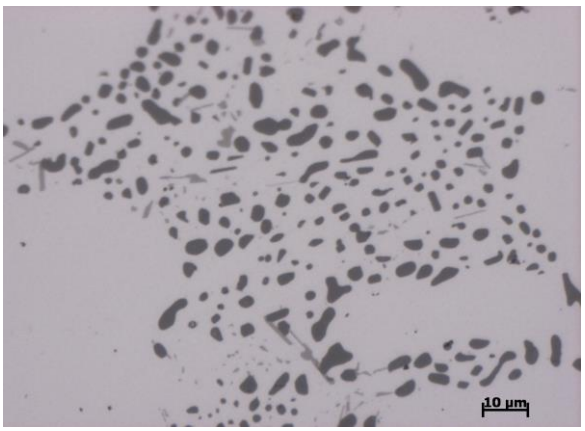


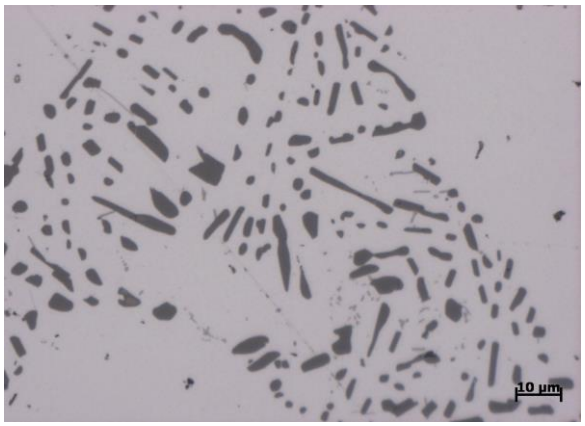


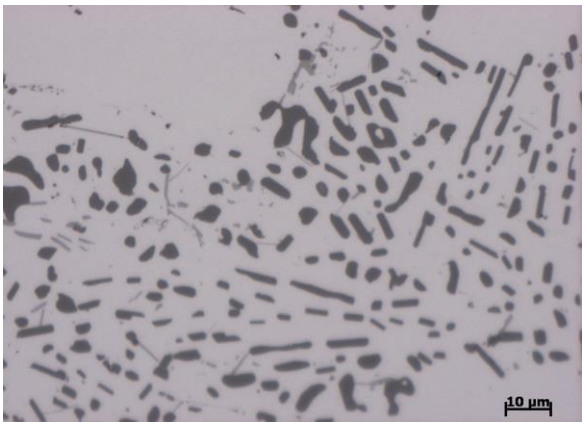




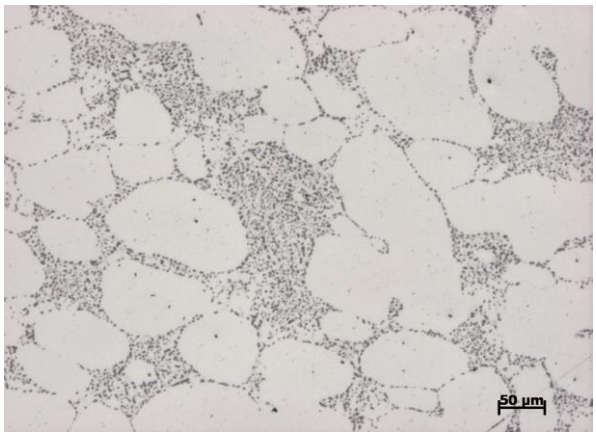


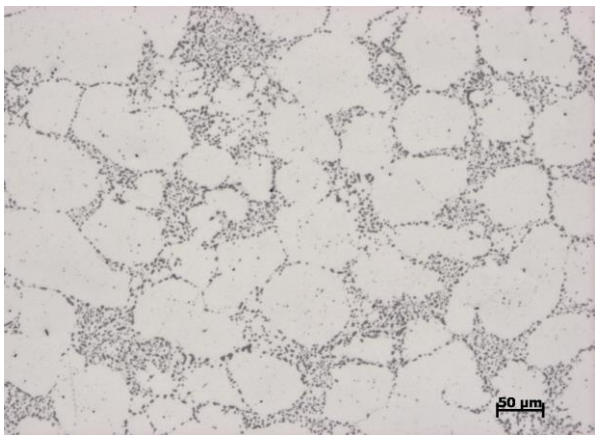


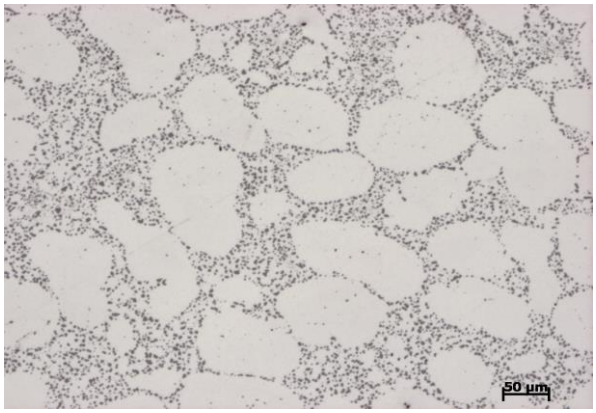




Vzorek 500/4+180/4



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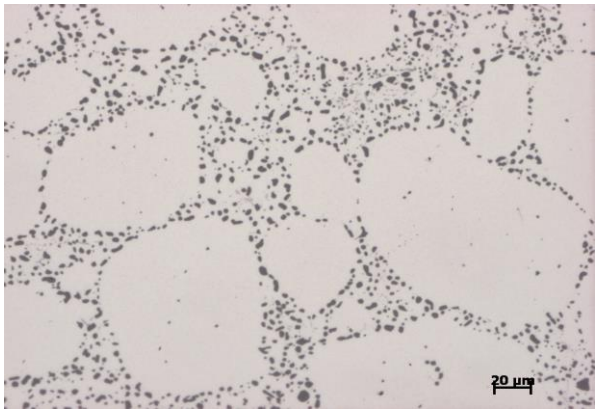
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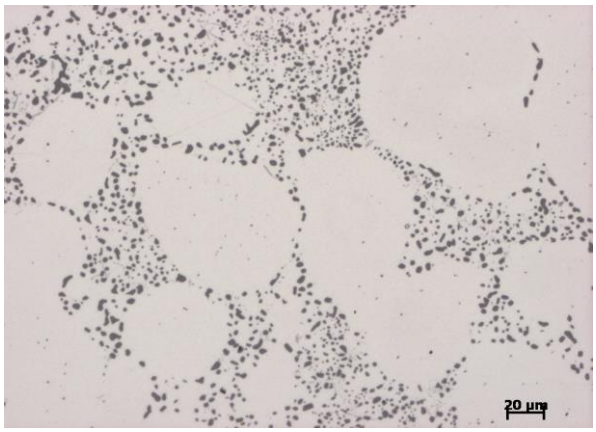
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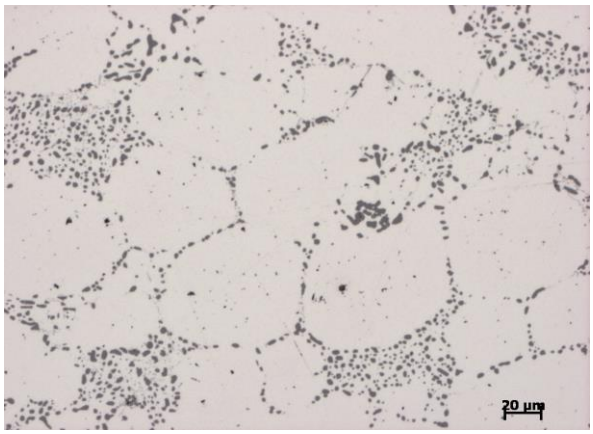
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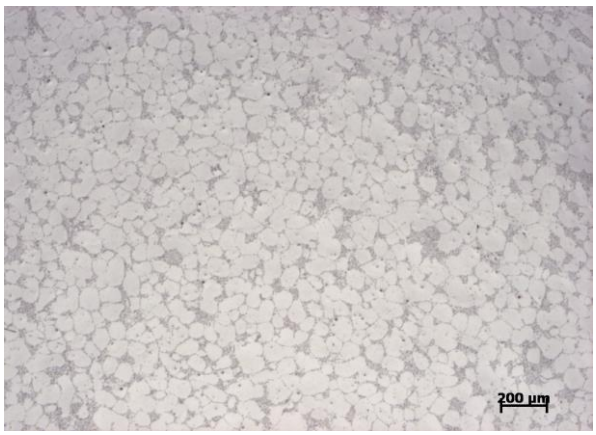
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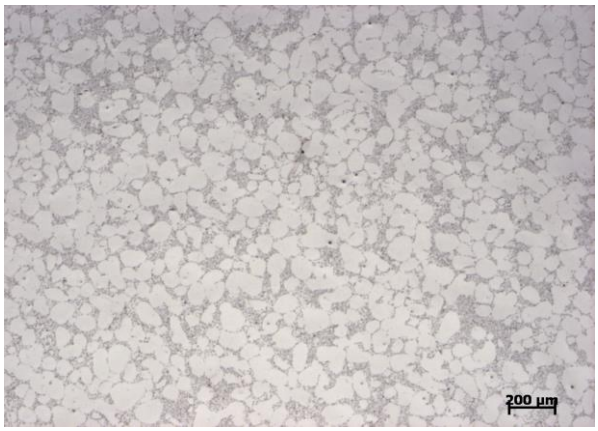
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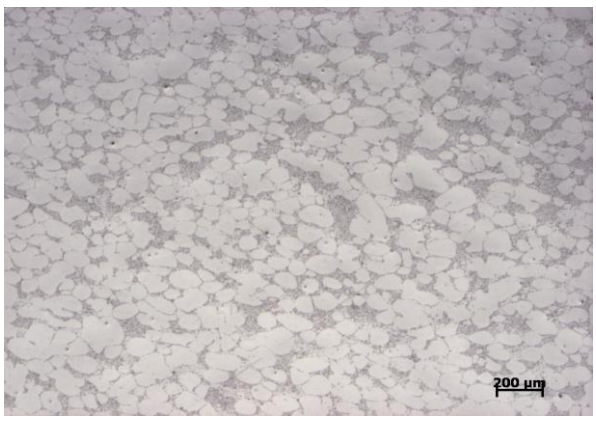
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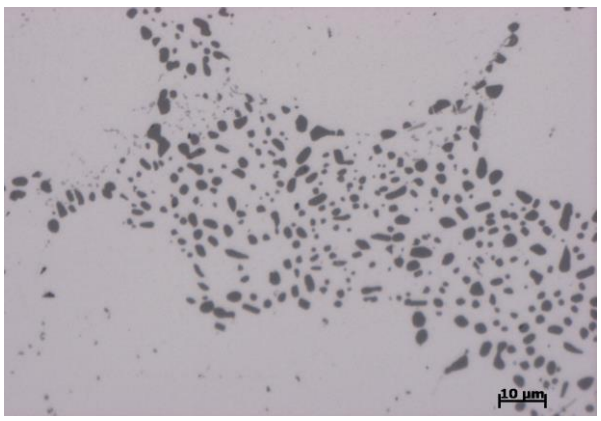
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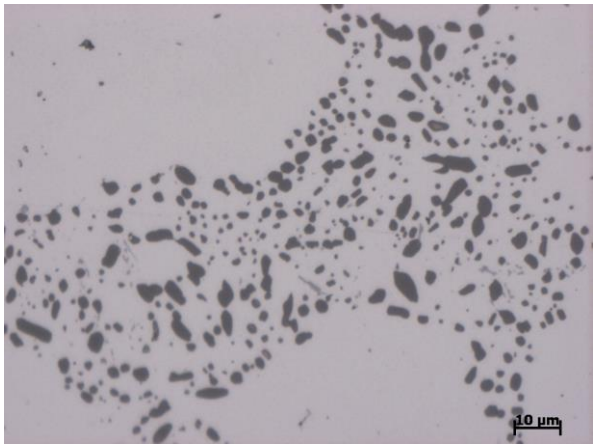
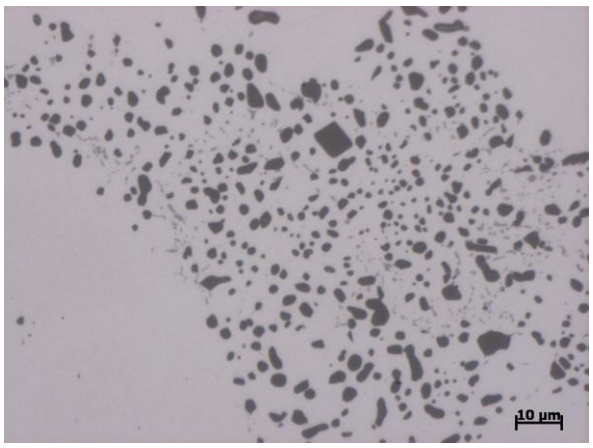
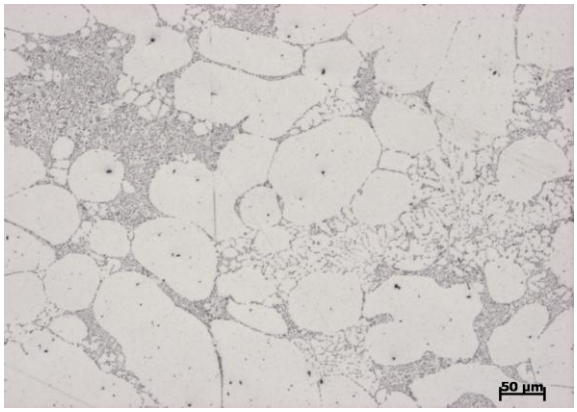
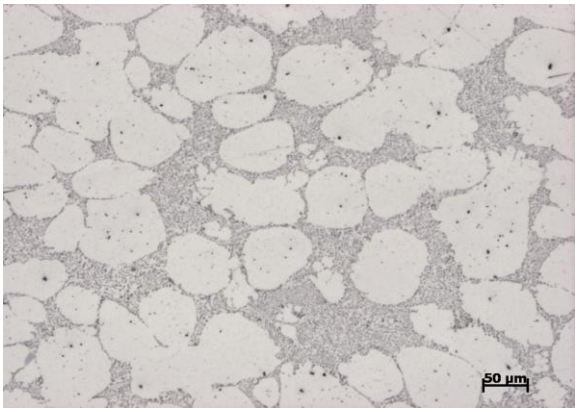
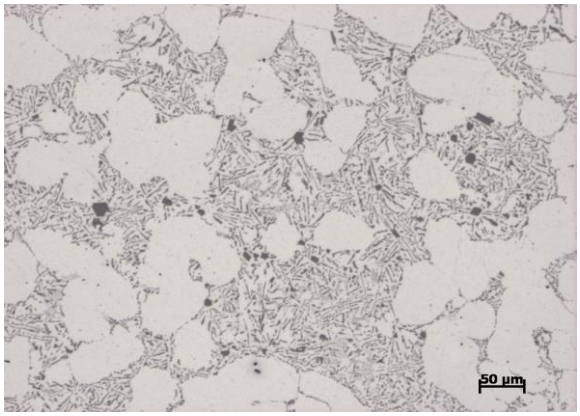


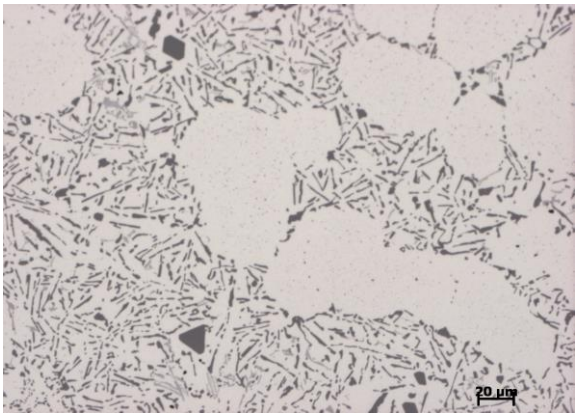


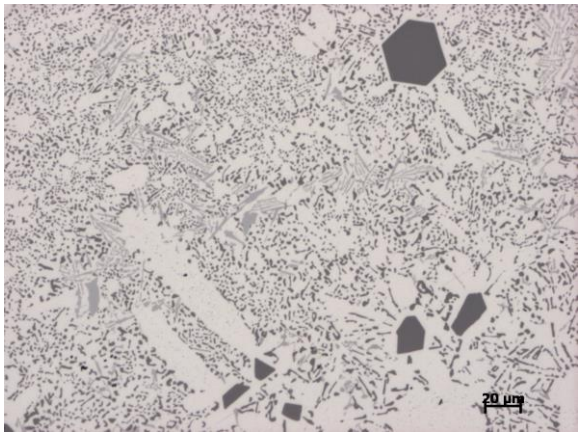
Vzorek 540/1+180/4

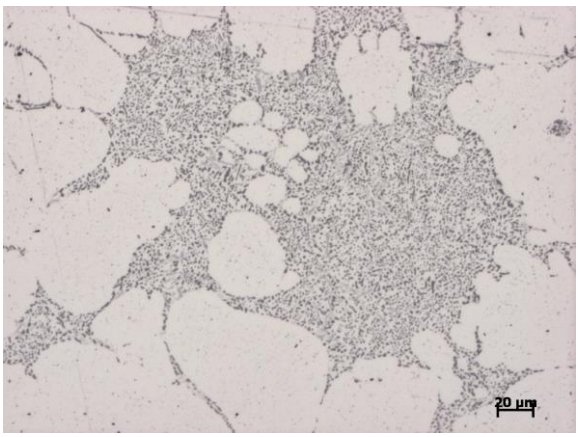












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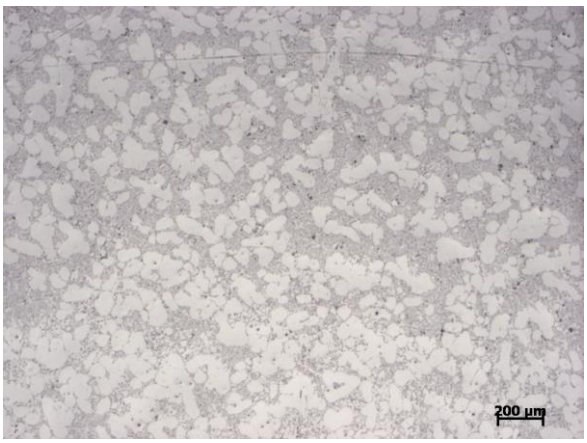
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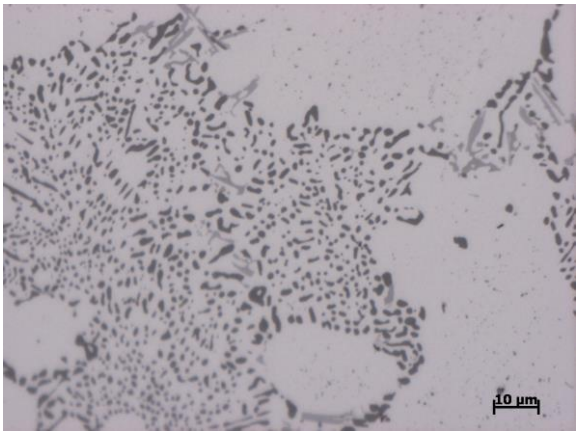
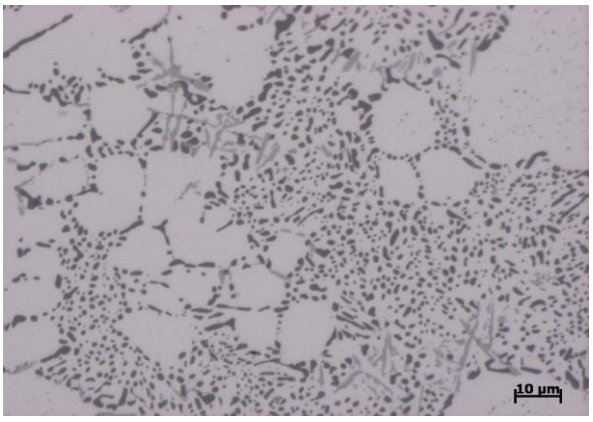
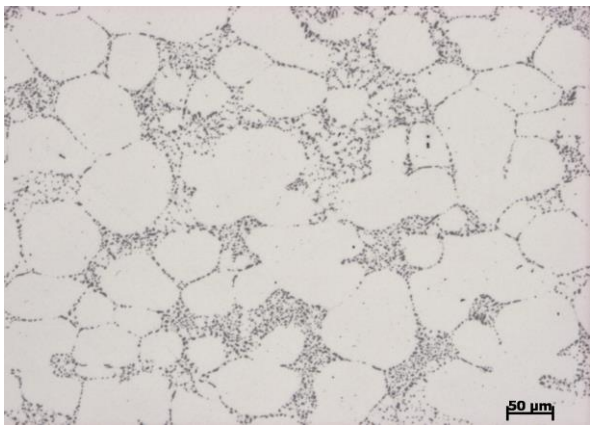
200 µm

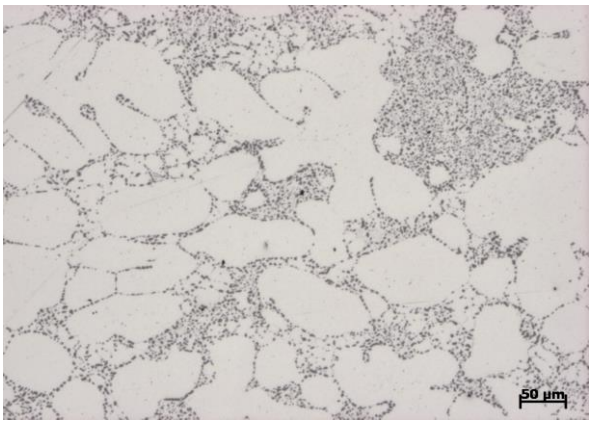

10 µm

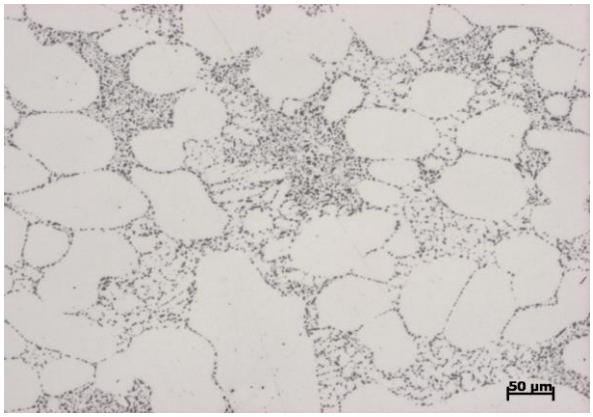
10 µm

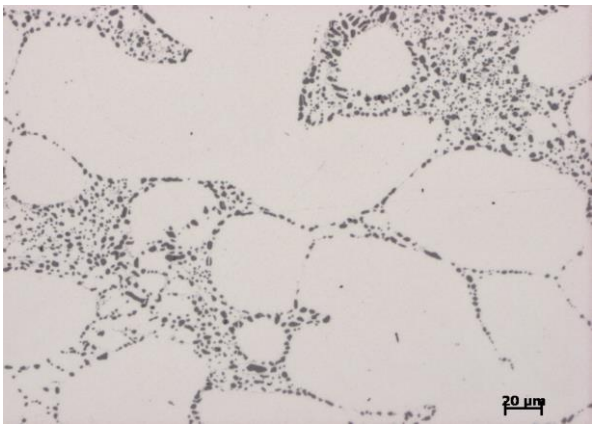

10 µm

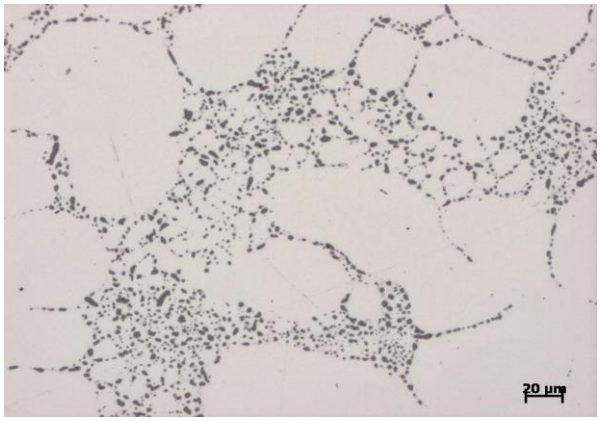
Vzorek 540/4+180/13

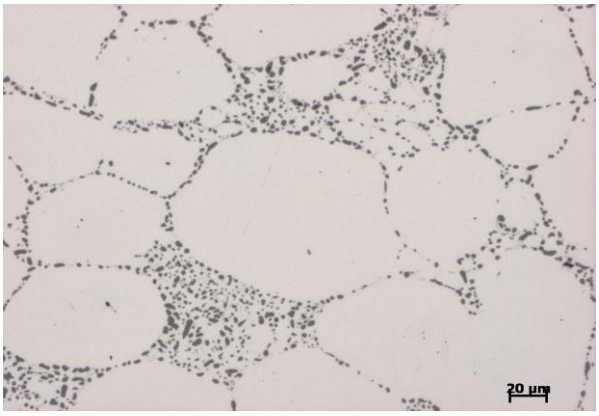


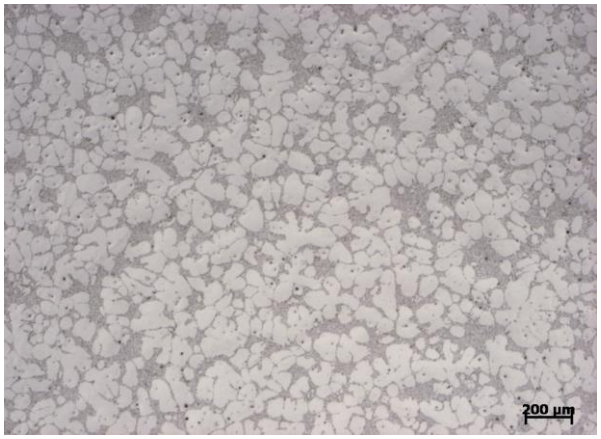


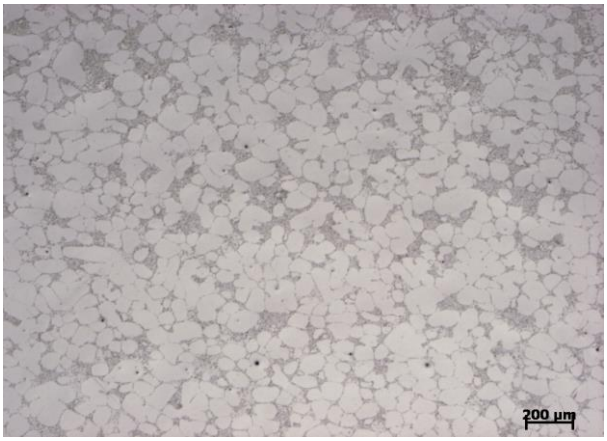


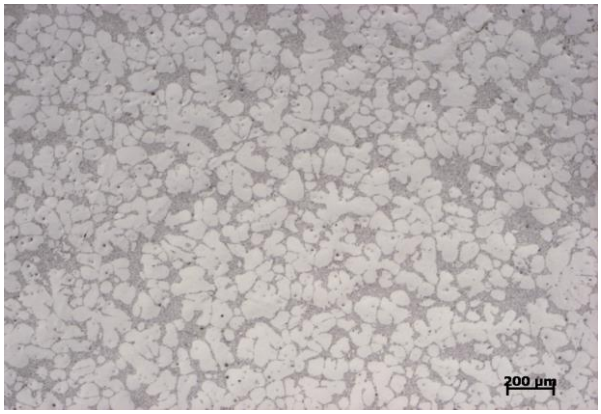


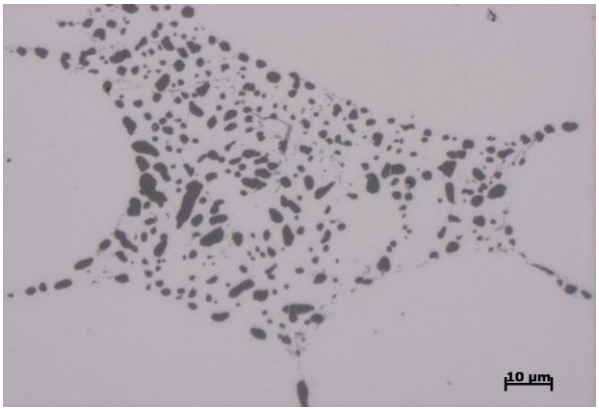


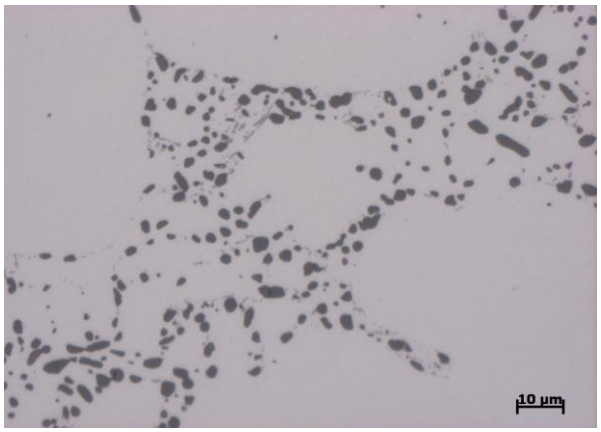


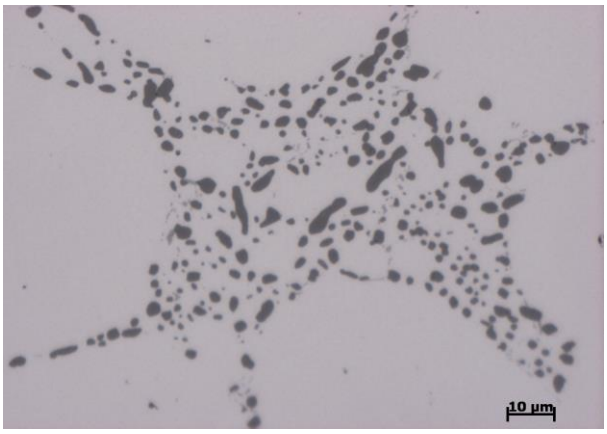




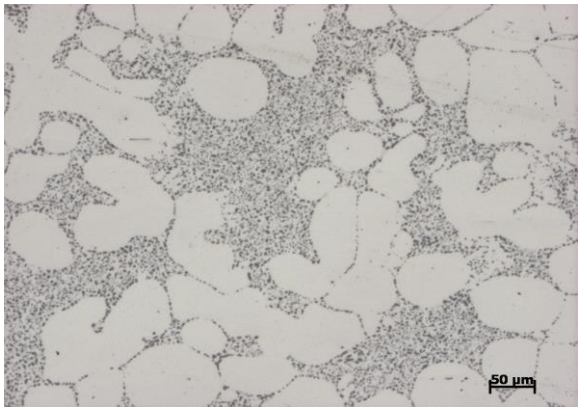


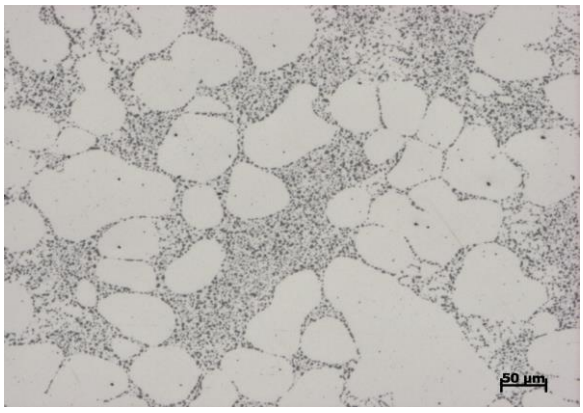


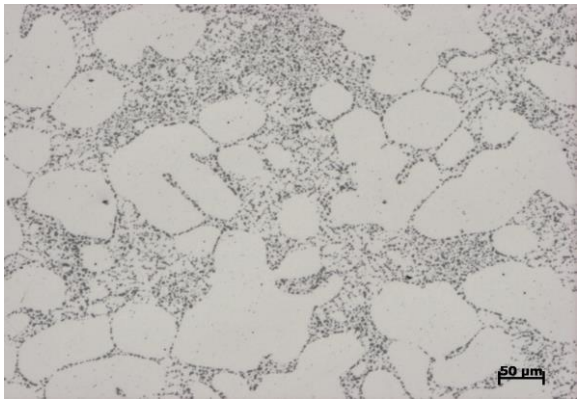


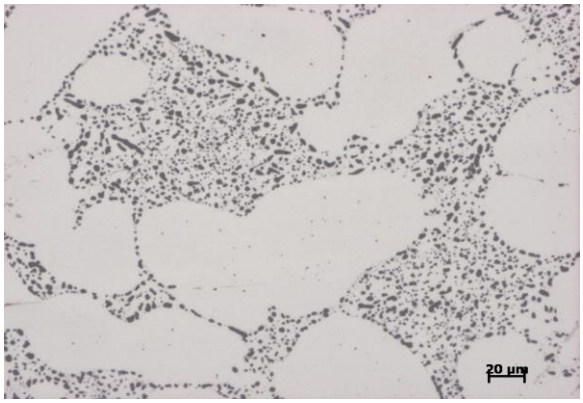


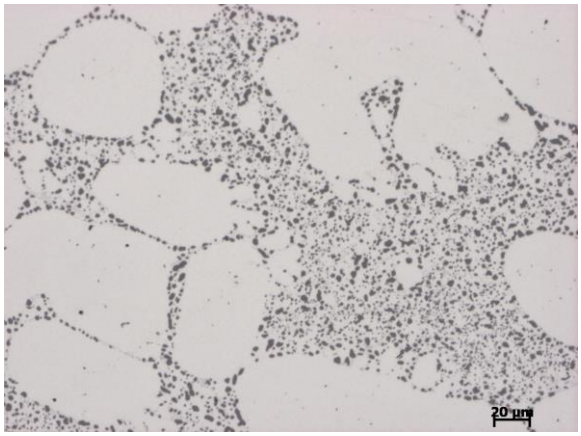
Vzorek 540/4







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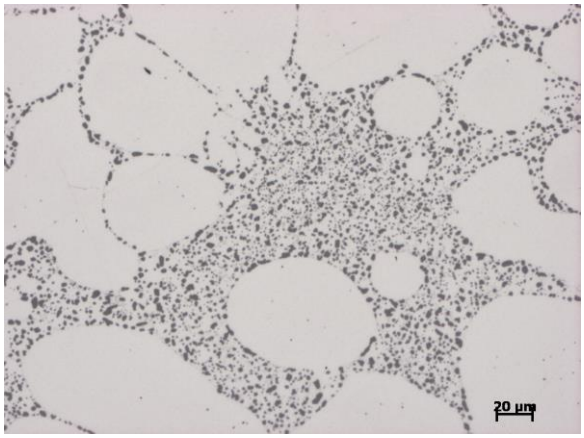
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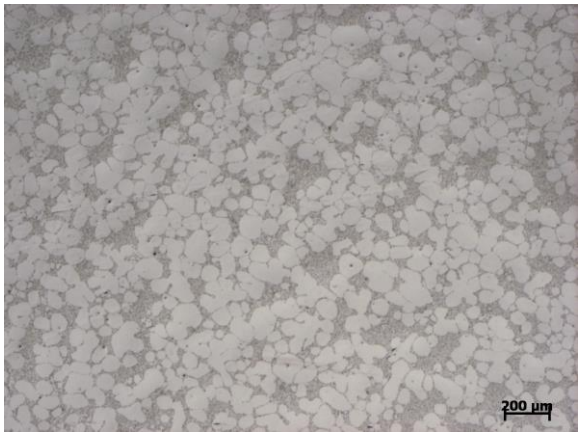
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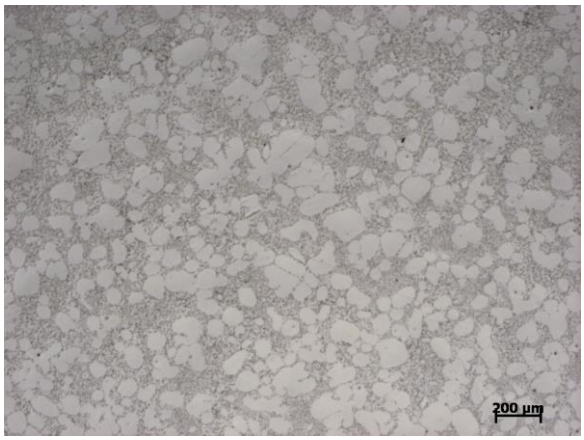
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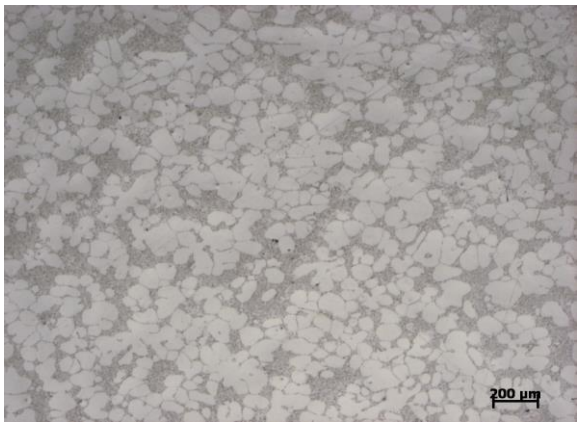
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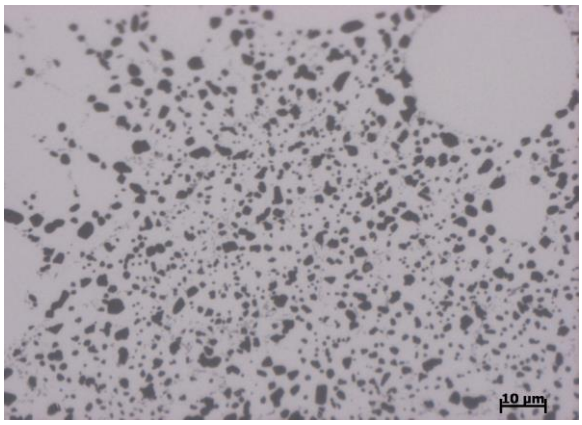
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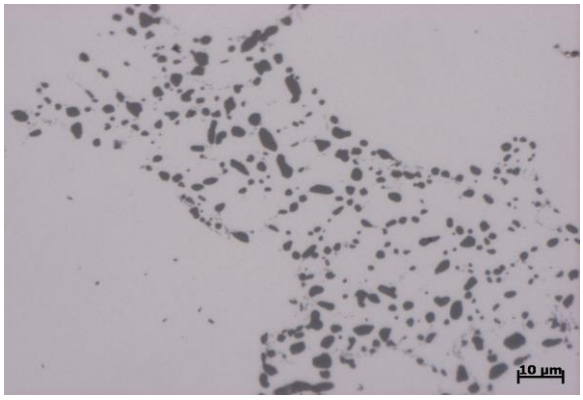
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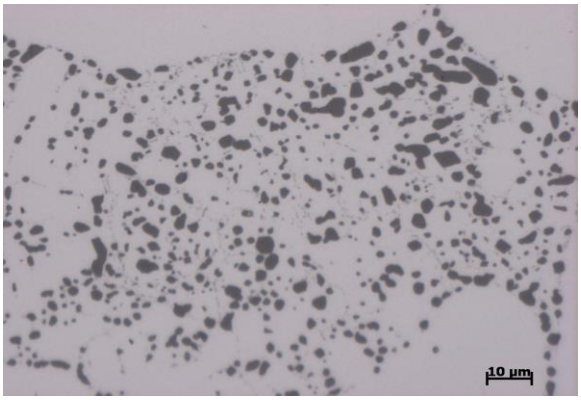
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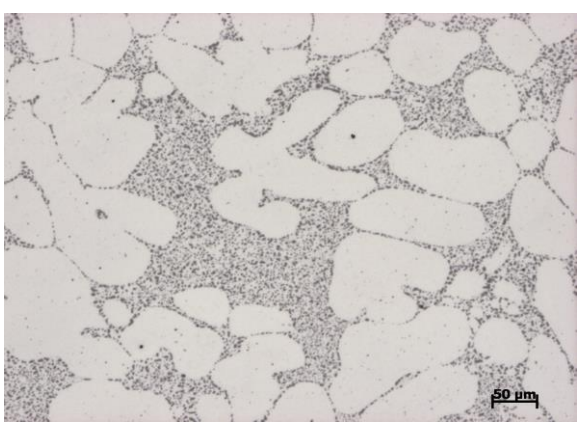
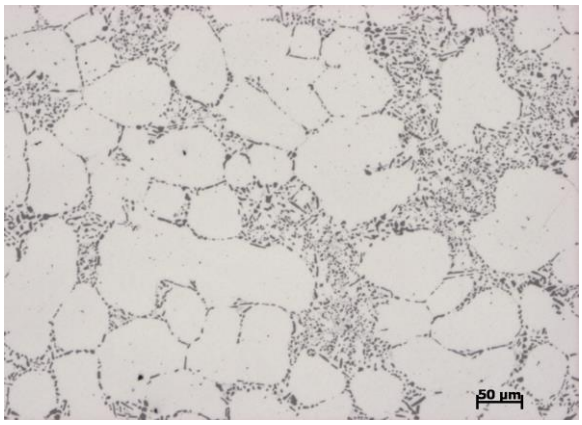
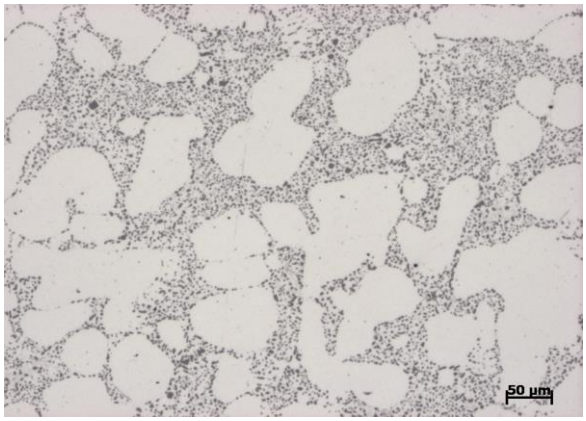
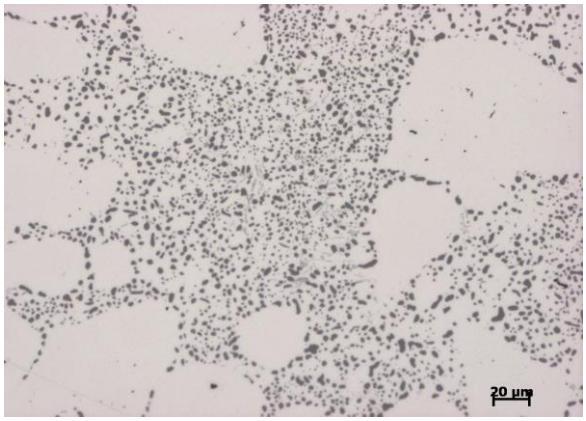
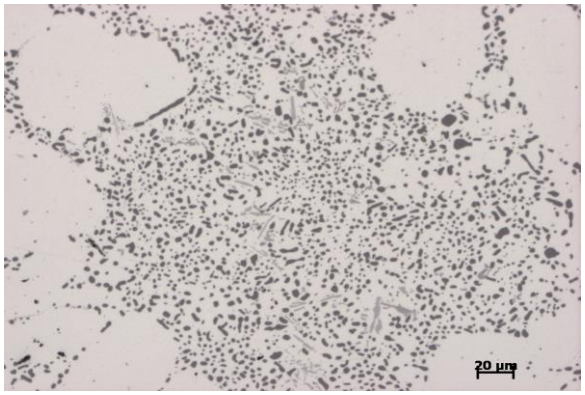
Vzorek 540/4+190/2

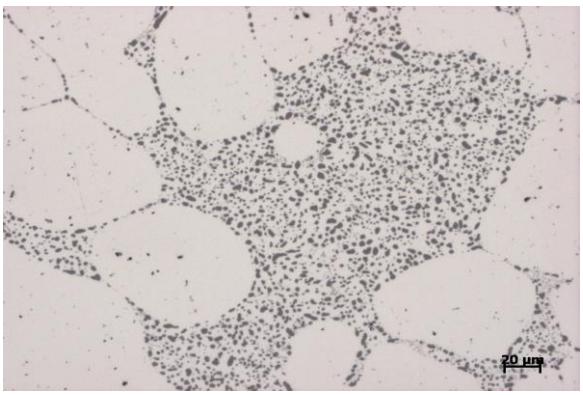


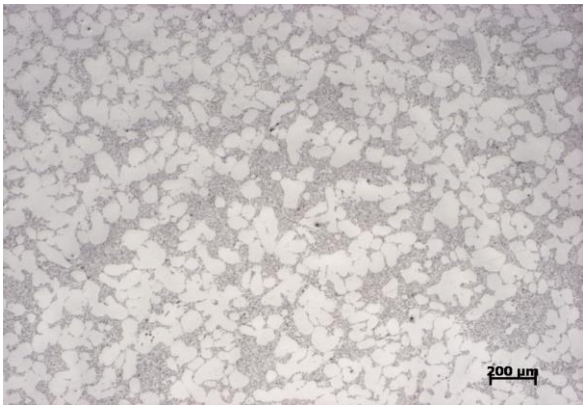


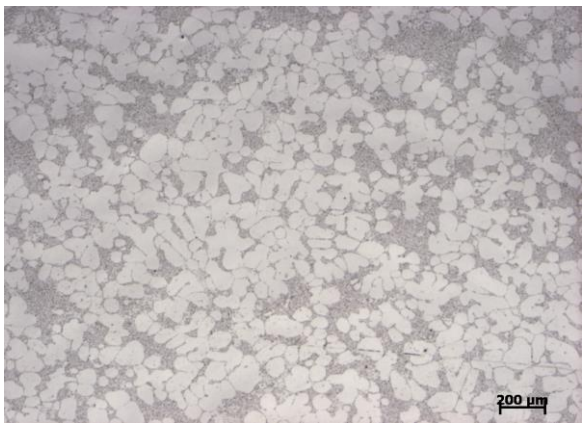








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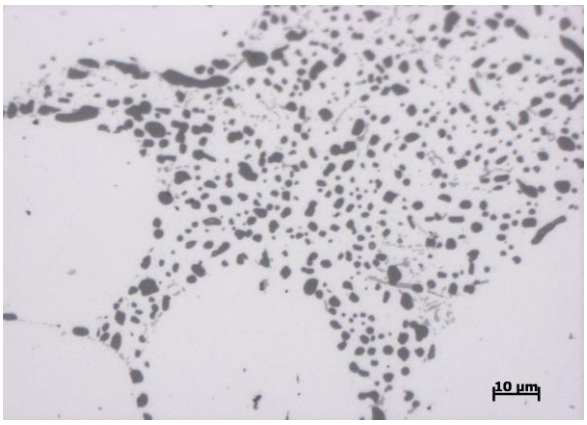
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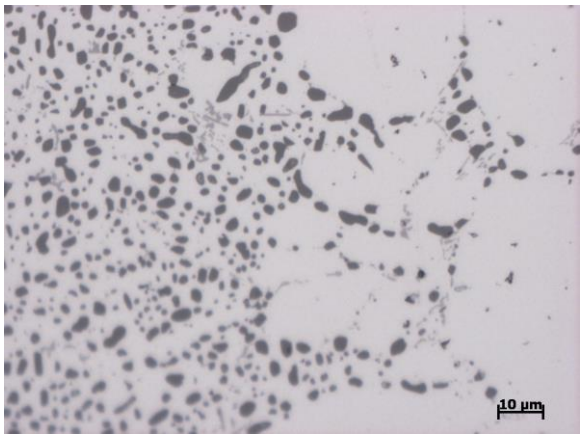
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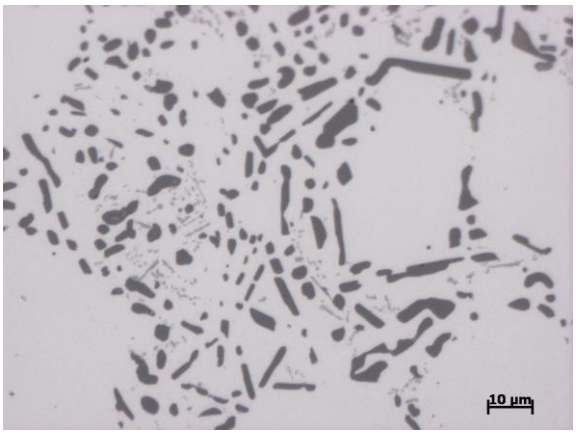
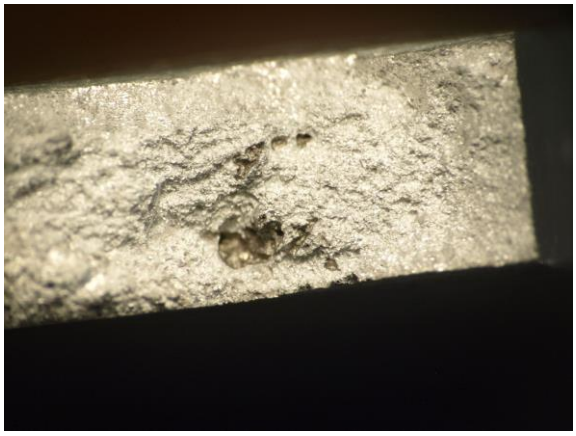
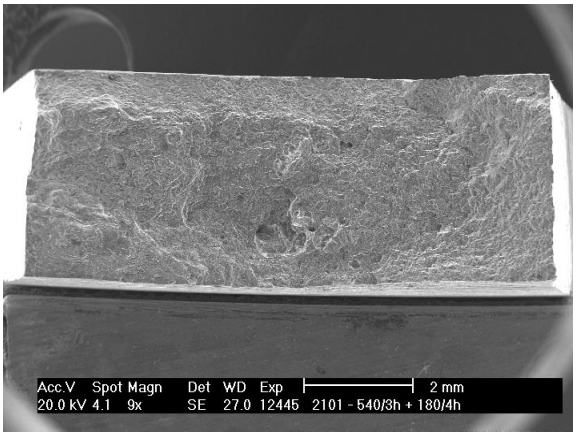

10 µm

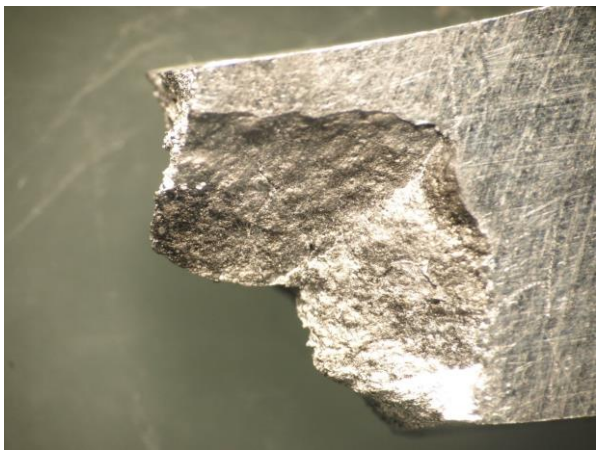
PŘÍLOHA 8

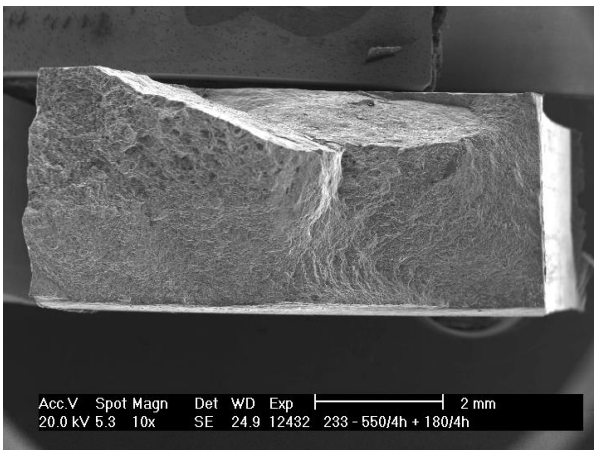
Vzorek 540/3+180/4



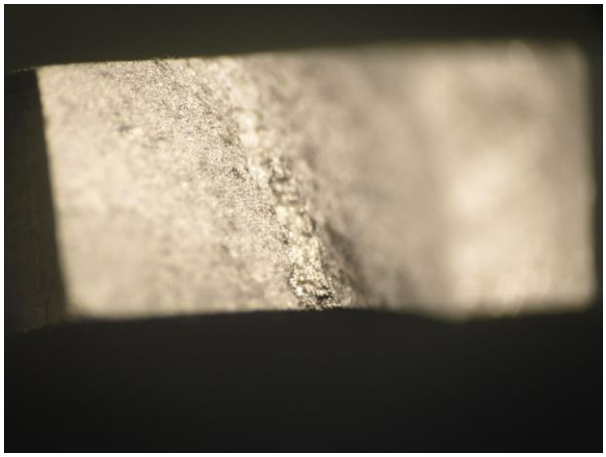


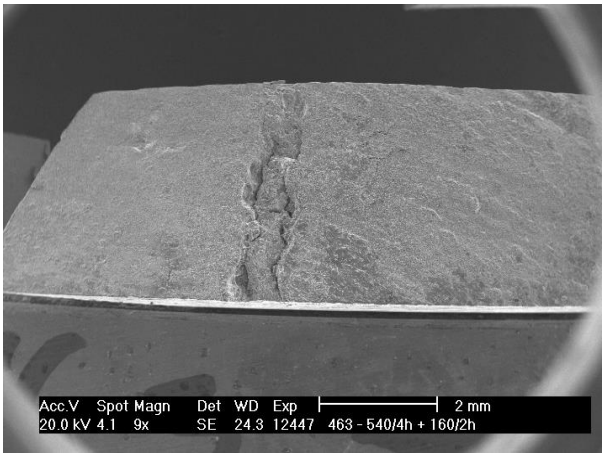
Vzorek 550/4+180/4



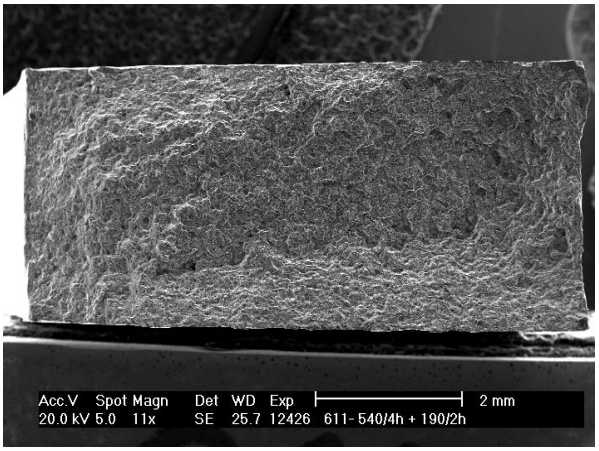


Vzorek 540/4+160/2

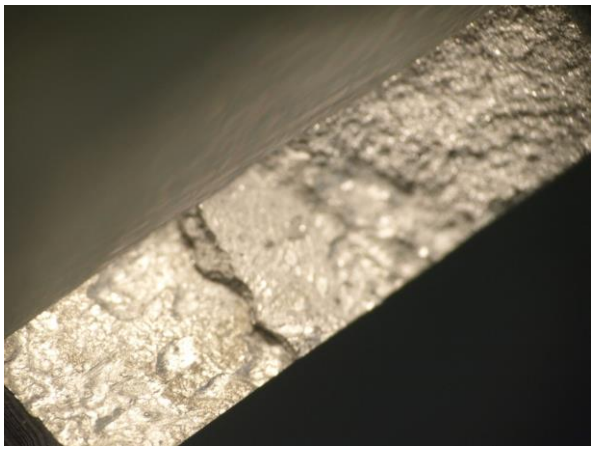


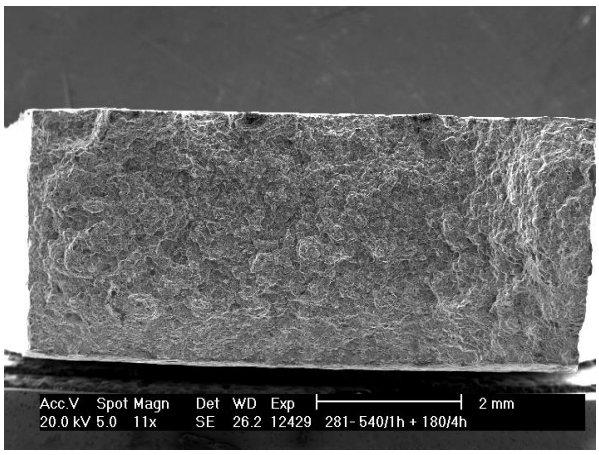
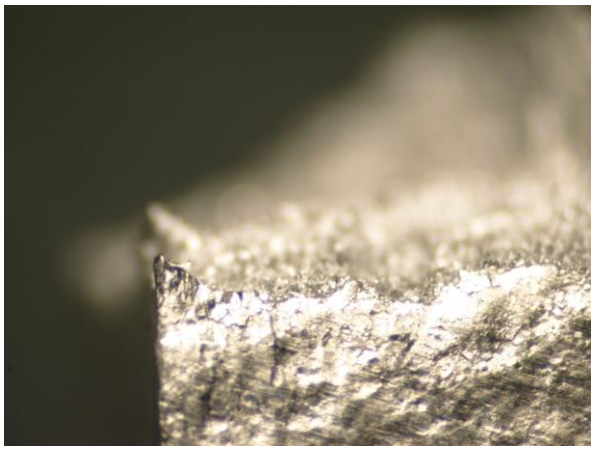
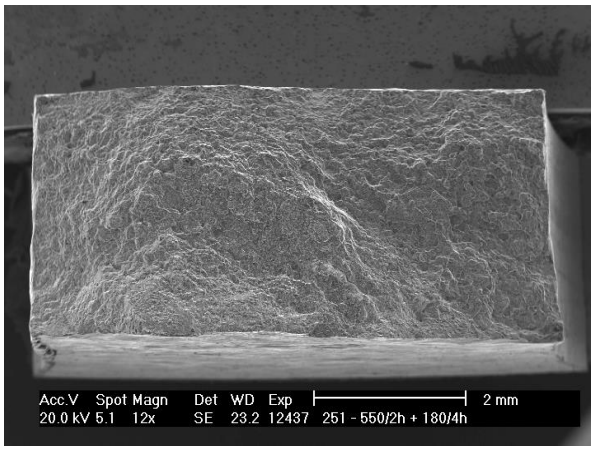


Vzorek 540/4+190/2



Vzorek 540/1+180/4





Vzorek 550/2+180/4