

SUPPLEMENTARY MATERIALS:

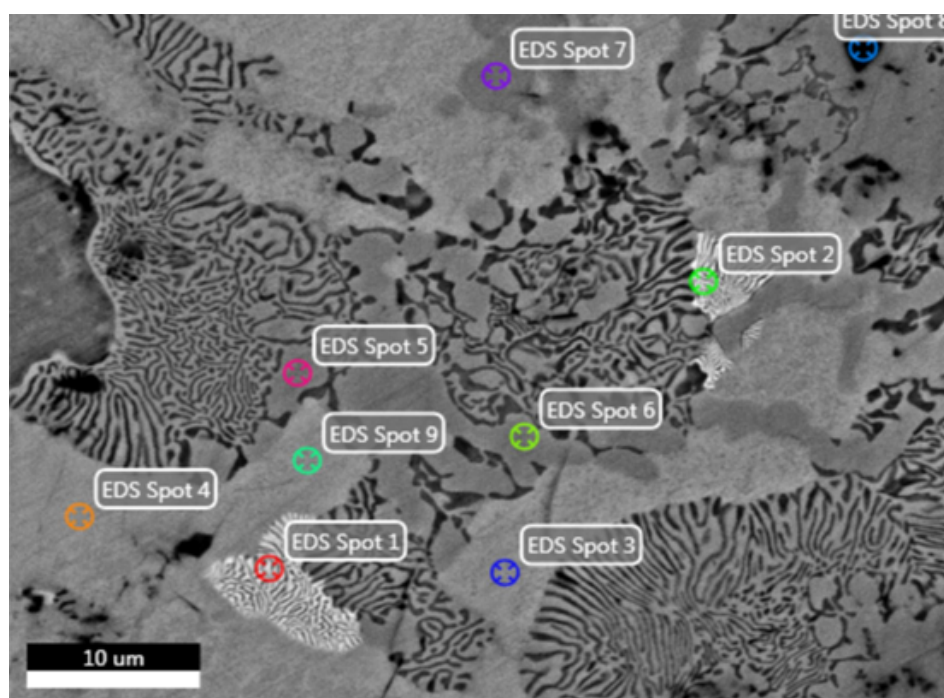
$\text{Al}_{10}\text{Ni}_3\text{Fe}_{0.83}$, an Fe-depleted phase in the Al–Ni–Fe system

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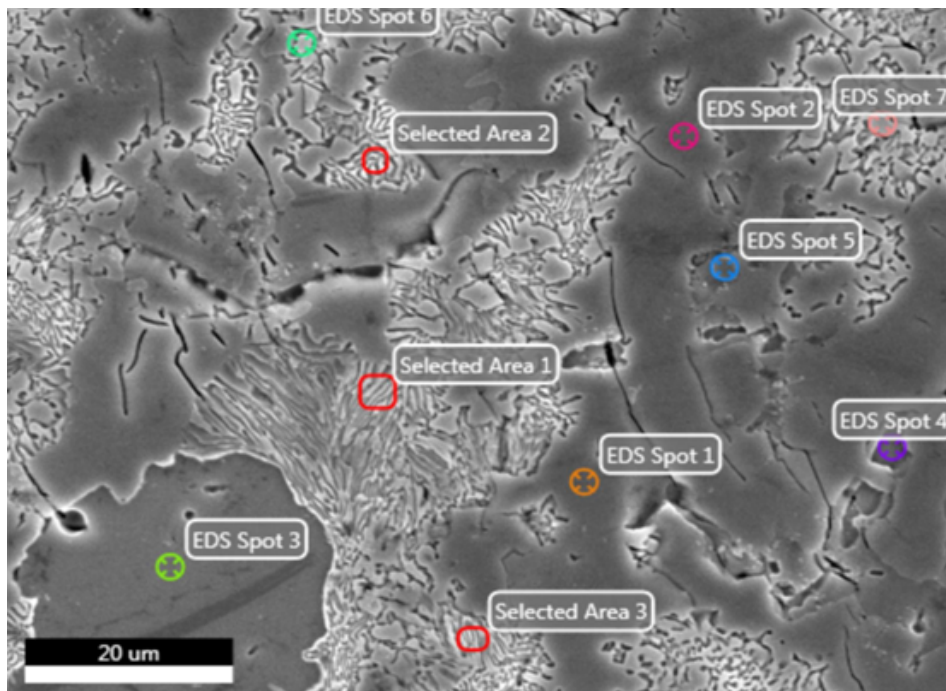
In order to guide the refinement process, the chemical compositions of two typical zones were examined quantitatively by energy dispersive X-ray spectroscopy (EDS) analysis attached to a Hitachi S-3400N SEM. The examined points for zone I and zone II are designated in Figs. 1 and 2, and the corresponding results are listed in Tables 1 and 2, respectively. From these statistic chemical compositions we assume that chemical composition segregation occurred during the HPS process.



Tab.1 EDS results for selected points in zone I

	Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
Spot1	AlK	47.02	65.77	1,387.14	7.16	0.22	1.06	0.95	0.44	1
	FeK	5.40	3.65	105.54	7.56	0.07	0.93	1.03	0.99	1.33
	NiK	47.58	30.58	556.56	2.85	0.46	0.94	1.04	0.99	1.04
Spot2	AlK	48.31	66.91	1,418.43	7.09	0.23	1.06	0.95	0.44	1
	FeK	5.55	3.71	105.46	8.01	0.07	0.92	1.03	0.99	1.32
	NiK	46.15	29.38	528.71	2.95	0.45	0.94	1.04	0.99	1.04
Spot3	AlK	54.09	71.78	1,695.24	6.68	0.28	1.06	0.96	0.48	1
	FeK	7.01	4.49	126.23	6.50	0.08	0.92	1.04	0.99	1.26
	NiK	38.90	23.73	440.00	3.12	0.37	0.93	1.04	0.99	1.05
Spot4	AlK	53.68	71.46	1,659.15	6.71	0.27	1.06	0.96	0.48	1
	FeK	6.62	4.26	119.17	6.68	0.08	0.92	1.04	0.99	1.27
	NiK	39.70	24.28	445.76	3.09	0.38	0.93	1.04	0.99	1.04

pot5	AlK	58.07	75.01	1,882.09	6.44	0.31	1.05	0.96	0.5	1
	FeK	3.24	2.02	60.01	10.18	0.04	0.91	1.04	0.99	1.31
	NiK	38.69	22.96	435.97	3.08	0.37	0.92	1.04	1	1.05
Spot6	AlK	58.30	75.18	1,887.87	6.43	0.31	1.05	0.96	0.5	1
	FeK	3.43	2.14	62.96	10.12	0.04	0.91	1.04	0.99	1.31
	NiK	38.28	22.69	429.46	3.09	0.37	0.92	1.04	1	1.05
Spot7	AlK	58.35	75.23	1,884.50	6.43	0.31	1.05	0.96	0.5	1
	FeK	2.91	1.81	53.77	10.60	0.03	0.91	1.04	0.99	1.32
	NiK	38.75	22.96	434.19	3.08	0.37	0.92	1.04	1	1.05
Spot8	O K	8.28	14.36	65.41	11.24	0.03	1.13	0.94	0.28	1
	AlK	76.09	78.25	2,507.79	4.28	0.55	1.01	0.99	0.71	1
	NiK	15.63	7.39	129.46	5.30	0.15	0.88	1.06	1	1.07
Spot9	AlK	53.93	71.65	1,644.67	6.69	0.27	1.06	0.96	0.48	1
	FeK	7.07	4.54	124.18	6.56	0.08	0.92	1.04	0.99	1.26
	NiK	39.00	23.81	429.95	3.12	0.37	0.93	1.04	0.99	1.05



Tab.2 EDS results for selected points in zone II

	Element	Weight %	Atomic %	Net Int.	Error %	K/ratio	Z	R	A	F
Area1	AlK	57.69	74.66	2,719.94	6.37	0.31	1.05	0.96	0.5	1
	FeK	5.90	3.69	152.78	6.44	0.07	0.91	1.04	0.99	1.26
	NiK	36.41	21.65	593.49	2.99	0.35	0.92	1.04	0.99	1.05
Area 2	AlK	56.95	74.06	2,700.55	6.40	0.30	1.05	0.96	0.5	1
	FeK	6.90	4.33	179.22	6.05	0.08	0.91	1.04	0.99	1.25
	NiK	36.15	21.60	596.18	3.01	0.35	0.92	1.04	0.99	1.05
Area 3	AlK	57.47	74.49	2,701.48	6.38	0.30	1.05	0.96	0.5	1
	FeK	6.13	3.84	158.23	6.49	0.07	0.91	1.04	0.99	1.26
	NiK	36.40	21.68	592.75	3.00	0.35	0.92	1.04	0.99	1.05
Spot1	AlK	59.29	75.95	2,947.65	6.29	0.32	1.05	0.96	0.51	1
	FeK	2.46	1.52	69.44	11.18	0.03	0.91	1.04	0.99	1.32
	NiK	38.25	22.52	652.48	2.87	0.37	0.92	1.04	1	1.05
Spot2	AlK	59.14	75.86	2,964.95	6.29	0.32	1.05	0.96	0.51	1
	FeK	1.95	1.21	56.22	12.64	0.02	0.91	1.04	0.99	1.33
	NiK	38.90	22.93	671.72	2.78	0.37	0.92	1.04	1	1.05
Spot3	AlK	56.37	73.35	2,840.83	6.27	0.30	1.05	0.96	0.51	1
	FeK	18.28	11.49	447.36	3.67	0.19	0.92	1.04	0.99	1.14
	NiK	25.35	15.16	427.74	3.48	0.24	0.93	1.04	0.98	1.05
Spot4	AlK	60.98	76.81	3,284.03	5.85	0.35	1.05	0.97	0.55	1
	FeK	20.30	12.35	481.99	3.32	0.20	0.91	1.04	0.99	1.11
	NiK	18.71	10.83	314.11	3.92	0.18	0.92	1.05	0.97	1.05
Spot5	O K	35.29	49.00	724.12	8.21	0.14	1.08	0.97	0.36	1
	AlK	59.60	49.07	4,161.06	3.90	0.42	0.96	1.01	0.74	1
	NiK	5.11	1.93	90.04	7.48	0.05	0.84	1.07	1.01	1.12
Spot6	O K	5.16	10.28	96.03	10.72	0.02	1.16	0.92	0.3	1
	AlK	59.80	70.60	3,319.66	5.93	0.34	1.03	0.97	0.54	1
	FeK	4.03	2.30	114.35	7.78	0.05	0.9	1.04	0.99	1.26
Spot7	NiK	31.00	16.82	556.31	3.02	0.29	0.91	1.05	1	1.05
	AlK	60.61	76.93	3,206.70	6.17	0.33	1.05	0.96	0.52	1
	FeK	3.37	2.07	97.11	9.01	0.04	0.91	1.04	0.99	1.29
	NiK	36.01	21.01	640.13	2.83	0.35	0.92	1.05	1	1.05

The Ni and Fe atoms were refined against different positions as shown in Tab. 3. From the results it is derived that the reported refinement (in bold) is the most suitable one that fit the EDS results.

location		compositions		
<i>6h</i>	<i>2c</i>	Al	Ni	Fe
	Ni	19.9999	7.6273	0
Ni	Fe	19.9999	6.000	1.6691
	Fe/Ni	**REFINEMENT UNSTABLE **		
	Ni	19.9999	1.6538	6.0000
Fe	Fe	19.9999	0	7.6897
	Fe/Ni	19.9999	0.7928	7.2070
	Ni	19.9999	3.5771	4.0695
Fe/Ni	Fe	19.9999	1.1967	6.4913
	Fe/Ni	19.9999	2.7388	5.2608

Tab. 3 Different choices of refinement and the resulting refined chemical compositions