

Table S1. The detailed EDS results of CrFeMoNbTiW HEA coatings (in at. %).

Annealing temperature	Region	Spot number	Fe	Mo	Cr	Ti	W	Nb	C
As-deposit	DR	1	36.59	10.11	11.11	13.87	11.02	14.97	-
		2	35.94	10.24	10.94	14.10	12.31	16.14	-
		3	35.84	10.94	11.99	14.56	11.64	15.27	-
		4	35.26	10.86	12.56	14.26	11.91	15.94	-
		5	35.62	11.30	12.70	14.31	11.92	15.78	-
		Va	35.85	10.69	11.86	14.22	11.76	15.62	-
		Std	0.44	0.45	0.72	0.23	0.43	0.43	-
	ID	P	1.2%	4.2%	6.1%	1.6%	3.6%	2.8%	-
		6	24.94	12.64	14.09	17.62	14.56	18.64	3.56
		7	25.06	11.67	13.26	18.42	15.42	16.42	2.33
		8	24.10	10.94	14.37	15.46	11.23	18.11	2.15
		9	23.56	10.54	13.56	14.31	12.43	15.22	2.69
		10	25.29	10.26	12.77	15.89	14.91	20.71	2.87
		Va	24.59	11.21	13.61	16.34	13.71	17.82	2.72
Std	0.65	0.86	0.57	1.49	1.60	1.89	0.49		
P	2.7%	7.7%	4.2%	9.1%	11.7%	10.6%	18.1%		
Annealed at 800 °C	DR	11	35.94	8.21	8.84	17.64	12.66	16.69	-
		12	34.75	9.48	9.56	13.56	11.55	17.85	-
		13	35.69	11.06	11.84	16.58	9.87	16.11	-
		14	34.12	10.65	12.56	14.33	11.91	17.33	-
		15	32.95	10.85	13.05	15.94	13.16	15.27	-
		Va	34.69	10.05	11.17	15.61	11.83	16.65	-
		Std	1.09	1.07	1.67	1.48	1.13	0.91	-
	ID	P	3.1%	10.7%	14.9%	9.5%	9.6%	5.4%	-
		16	26.84	10.66	15.22	18.55	9.64	18.96	2.59
		17	25.12	11.33	14.99	17.99	9.88	15.48	2.11
		18	26.48	12.28	13.64	15.88	11.17	22.15	3.58
		19	24.99	11.42	12.67	16.54	11.58	16.48	2.69
		20	24.97	12.41	14.08	18.49	8.18	17.38	3.58
		Va	25.68	11.62	14.12	17.49	10.09	18.09	2.91
Std	0.81	0.65	0.93	1.08	1.21	2.33	0.58		
P	3.2%	5.6%	6.6%	6.2%	12.0%	12.9%	20.0%		
Annealed at 900 °C	DR	21	33.96	9.87	12.05	14.59	11.56	19.45	-
		22	29.56	9.56	11.56	15.84	11.48	17.44	-
		23	31.59	10.94	12.59	16.49	13.48	16.22	-
		24	29.41	11.23	13.48	16.07	13.09	15.46	-
		25	31.53	11.20	13.97	15.26	13.99	17.08	-
		Va	31.21	10.56	12.73	15.65	12.72	17.13	-
		Std	1.66	0.70	0.89	0.66	1.02	1.35	-
	ID	P	5.3%	6.7%	7.0%	4.2%	8.0%	7.9%	-
		26	23.59	9.88	14.23	15.99	12.64	18.96	5.61
		27	22.12	10.33	13.94	17.48	12.06	20.46	4.33
		28	21.46	10.96	15.94	14.94	14.31	19.99	3.96
		29	20.13	11.48	13.46	16.99	13.46	16.48	4.64
		30	20.60	12.45	14.13	16.40	13.43	20.16	3.01
		Va	21.58	11.02	14.34	16.36	13.18	19.21	4.31
Std	1.22	0.90	0.84	0.87	0.77	1.46	0.85		
P	5.6%	8.2%	5.9%	5.3%	5.8%	7.6%	19.7%		

Annealed at 1000 °C	DR	31	31.59	9.88	11.56	14.98	11.69	17.66	-
		32	30.94	10.68	12.64	15.82	13.28	18.43	-
		33	29.58	11.64	13.99	16.44	13.85	16.44	-
		34	29.69	13.49	12.56	16.01	11.91	17.68	-
		35	28.50	12.36	13.50	16.05	10.07	17.34	-
		Va	30.06	11.61	12.85	15.86	12.16	17.51	-
		Std	1.09	1.26	0.84	0.48	1.32	0.64	-
		P	3.6%	10.9%	6.5%	3.1%	10.9%	3.7%	-
	ID	36	23.88	10.66	12.58	16.73	13.04	17.98	2.99
		37	23.67	11.97	13.45	17.99	13.96	16.79	3.86
		38	22.16	13.46	13.11	17.56	11.68	19.48	3.41
		39	21.03	12.96	12.97	17.11	13.45	19.77	2.97
		40	19.81	12.00	14.44	16.71	13.02	20.78	2.57
		Va	22.11	12.21	13.31	17.22	13.03	18.96	3.16
		Std	1.55	0.96	0.63	0.49	0.76	1.41	0.44
		P	7.0%	7.9%	4.7%	2.9%	5.8%	7.4%	13.9%

Table.S1 show the detailed EDS results of CrFeMoNbTiW HEA coatings (in at. %), where Va, Std and P represents the average value, the standard deviation value and the ratios of Std/Va of each area at different annealing temperature, respectively. as shown in Table. S1, most of P values are smaller than 10%. That suggests the element deviation is small and the average value could well represent the composition.