

Table 3.1: Physical and mechanical properties of experimental coatings.

Material	Density (kg/m ³)	Melting Point (K)	Young's Modulus (GPa)	Poisson's Ratio	Hardness (MPa)
Al	2,700	933	62 [†]	0.33	591 ± 26*
Cu	8,920	1,357	128 [†]	0.30	1,220 ± 50*
SiO ₂ (PECVD)	2,240	1,883	74 ^{††}	0.17	9,793 ± 1,253
SiO ₂ (TEOS)	2,170	-	-	-	13,161 ± 1,187
Si ₃ N ₄	2,350	2,173**	304 ^{††}	0.27	19,580 ± 1,918
Al ₂ O ₃	3,970	2,318	380 ^{††}	0.23	20,580

* Bulk materials.

† ASM Metals Handbook, ASM International.

** Sublimation temperature.

†† Handbook of Materials Science, CRC Press Inc.

Table 3.3: Experiment results on blanket wafers (Buehler CHEMOMET Pad).

Coating	μ	Duration (min)	Distance Slid (m)	Mass Loss (mg)	Volume Loss (mm ³)	MRR (nm/min)	NMRR (nm/m)	k_p (MPa ⁻¹)	k_w
Al	0.28	1	42	7.19	2.66	328.46	7.84	162.42×10^{-9}	0.96×10^{-4}
	0.26	1	42	7.56	2.80	345.37	8.24	170.78	1.01
Cu	0.22	2	84	27.83	3.12	192.42	4.59	95.14	1.16
	0.23	2	84	30.93	3.47	213.85	5.10	105.74	1.29
SiO ₂ (PECVD)	0.28	2	84	0.52	0.23	14.32	0.34	7.08	0.69
	0.19	2	84	0.32	0.14	8.81	0.21	4.36	0.43
SiO ₂ (TEOS)	0.15	4	168	0.80	0.37	11.37	0.27	5.62	0.74
	0.18	4	168	0.78	0.36	11.08	0.26	5.48	0.72
Si ₃ N ₄	0.15	4	168	0.54	0.23	7.09	0.17	3.50	0.69
	0.20	4	168	0.68	0.29	8.92	0.21	4.41	0.86

Table 3.4: Experiment results on blanket wafers (Rodel IC-1400 Pad).

Coating	μ	Duration (min)	Distance Slid (m)	Mass Loss (mg)	Volume Loss (mm ³)	MRR (nm/min)	NMRR (nm/m)	k_p (MPa ⁻¹)	k_w
Al	0.11	1	42	6.14	2.27	280.50	6.70	138.70×10^{-9}	0.82×10^{-4}
	0.17	1	42	10.98	4.07	501.60	11.97	248.03	1.47
Cu	0.15	2	84	13.90	1.56	96.10	2.29	47.52	0.58
	0.15	2	84	16.85	1.89	116.50	2.78	57.60	0.70
SiO ₂ (PECVD)	0.09	2	84	0.34	0.15	9.36	0.22	4.63	0.45
	0.14	2	84	0.44	0.20	12.11	0.29	5.99	0.59
SiO ₂ (TEOS)	0.09	4	168	0.74	0.34	10.52	0.25	5.20	0.68
	0.10	4	168	0.99	0.46	14.07	0.34	6.96	0.92
Si ₃ N ₄	0.09	4	168	0.39	0.17	5.12	0.12	2.53	0.50
	0.09	4	168	0.30	0.13	3.94	0.09	1.95	0.38

Table 3.7: Surface roughness before and after polishing on Rodel pads with 300 nm abrasive.

Material	Before Polishing			After Polishing		
	R _a (nm)	R _q (nm)	R _z (nm)	R _a (nm)	R _q (nm)	R _z (nm)
Al	1.7	2.2	23.7	6.4	10.8	140.1
Cu	3.7	4.6	35.0	4.0	5.7	98.2
SiO ₂ (PECVD)	1.3	1.5	12.1	1.5	1.8	18.9
SiO ₂ (TEOS)	1.1	1.4	11.6	1.2	1.4	14.0
Si ₃ N ₄	1.0	1.2	10.1	1.1	1.2	12.1