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Supplementary Information

Effect of carbide on wear mechanisms at 300°C of composite coatings sprayed by HVOF

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1. Wear Area Definition

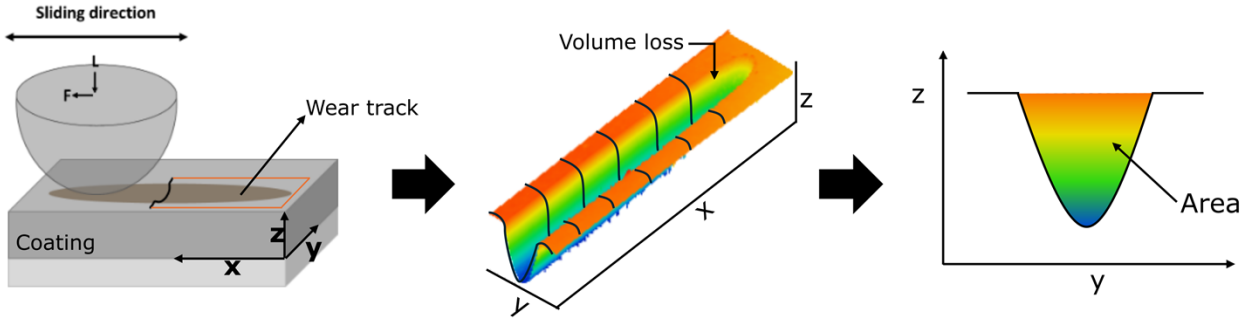

Figure S1. Schematic example of extraction of measurements of cross-sectional wear area. A portion of a wear track is scanned with the white light interferometric surface profilometer. This provides three-dimensional metrology data for all the heights on the surface in the wear track and adjacent to it. Multiple profiles are drawn perpendicular to the sliding direction using analysis software provided by the instrument manufacturer (Zygo Corporation, USA). Each profile is then analysed for the area under the curve with respect to the unworn surface height using OriginPro software (OriginLab, USA). At least thirty profiles are averaged to determine the cross-sectional wear area.

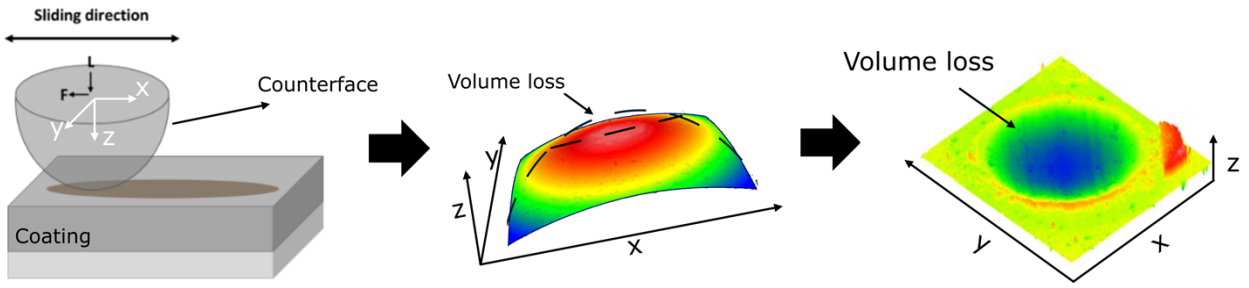

Figure S2 Schematic example of extraction of wear volume for counterfaces. Counterfaces are scanned with the white light interferometric surface profilometer. The three-dimensional metrology date for heights are compared to that for a sphere of the diameter used for the experiment. Using analysis software provided by the instrument manufacturer, the real profile is subtracted from the ideal sphere from which the volume loss is measured as the volume below the flattened surface.

2. Coefficient of Friction

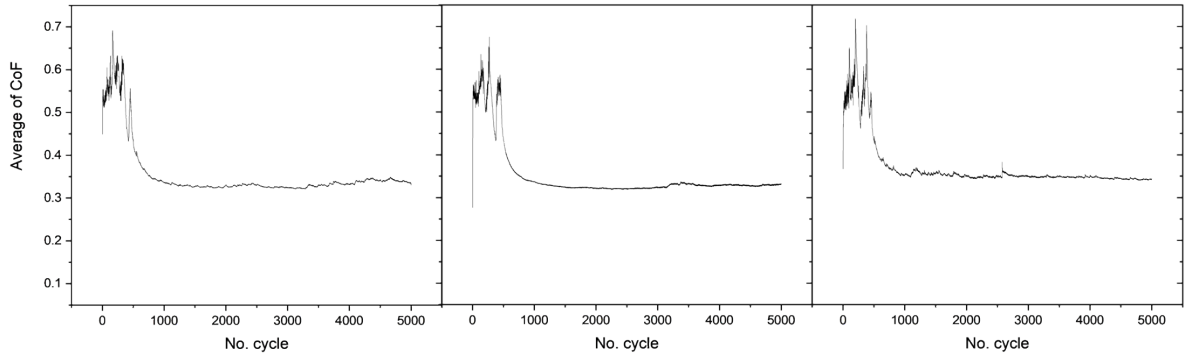

Figure S3. Coefficient of friction of SW coating at room temperature and 5000 cycles for three repeats.

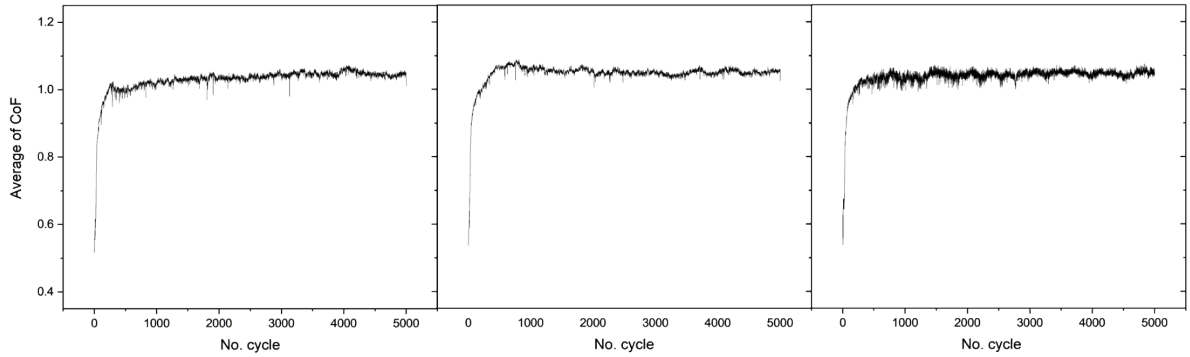

Figure S4. Coefficient of friction of SW coating at 300°C and 5000 cycles for three repeats

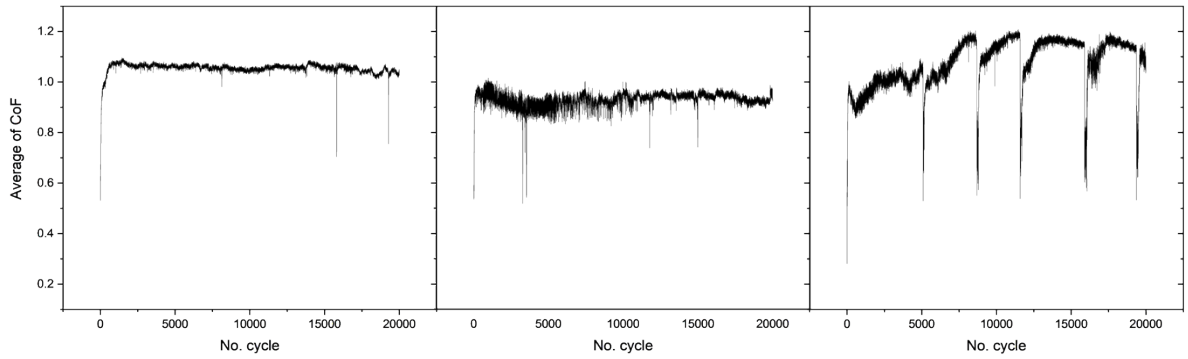

Figure S5. Coefficient of friction of SW coating at 300°C and 20000 cycles for three repeats.

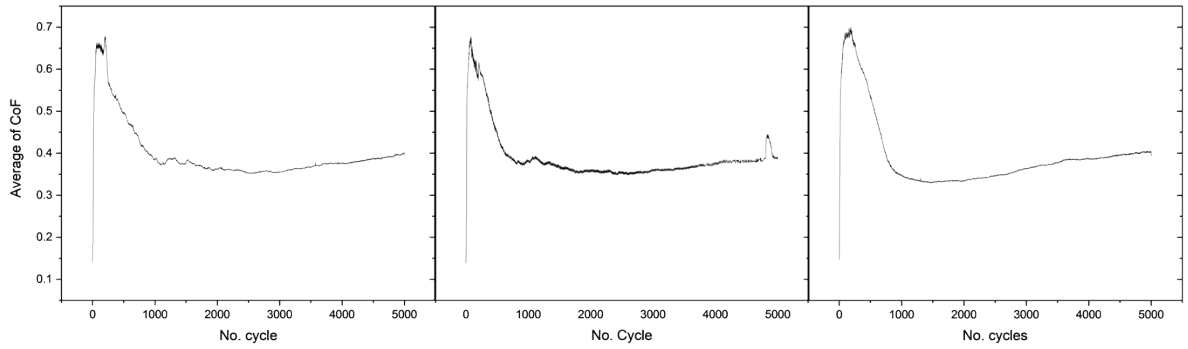

Figure S6. Coefficient of friction of SWC coating at room temperature and 5000 cycles for three repeats.

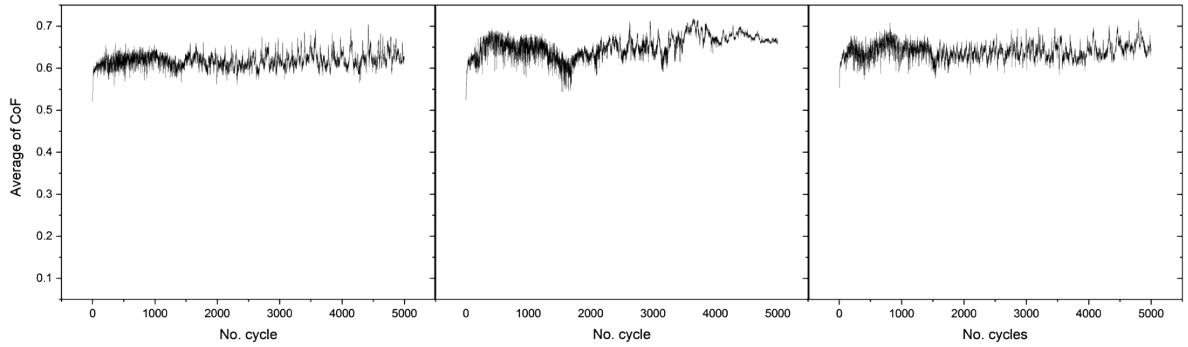

Figure S7. Coefficient of friction of SWC coating at 300°C and 5000 cycles for three repeats

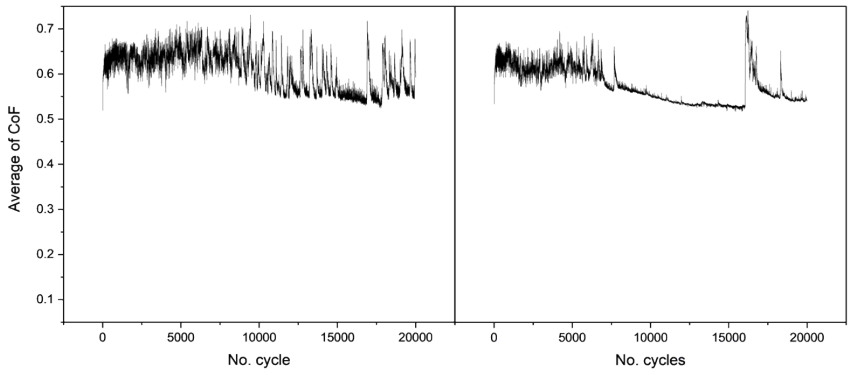

Figure S8. Coefficient of friction of SWC coating at 300°C and 20000 cycles for two repeats

Table T1. Coatings wear rates for various conditions for coatings SW and SWC. Entries are wear rates calculated from at least thirty cross-sectional wear area measurements as shown in S1.

Coating	Repeat	Wear rate x 10^{-6} (mm^3/N.m)		
		RT - 5.000 cycles	**300°C - 5.000 cycles**	**300°C - 20.000 cycles**
SW	1	1.7 ± 0.5	2.3 ± 0.4	3.2 ± 0.6
	2	1.6 ± 0.4	2.9 ± 0.3	2.6 ± 0.4
	3	1.5 ± 0.5	2.2 ± 0.4	4 ± 0.5
SWC	1	2.3 ± 0.9	39.2 ± 3.9	22.2 ± 2.1
	2	2.7 ± 1.1	29.4 ± 3.8	13.6 ± 1.3
	3	1.9 ± 0.6	37.1 ± 4.7	NA

NA: not available

Table T2 . Counterface wear rates for various conditions, where each entry is a measurement of the counterface wear conducted as shown in S2

Coating	Repeat	Wear rate x 10^{-8} (mm^3/N.m)		
		RT - 5.000 cycles	**300°C - 5.000 cycles**	**300°C - 20.000 cycles**
SW	1	5.93	0.40	0.04
	2	7.27	0.06	*
	3	5.10	0.05	*
SWC	1	10.52	1.28	0.002
	2	11.32	14.59	3.750
	3	6.89	7.98	NA

NA: not available, * Unmeasurable