Table S1. OCP evolution of 1.4108 material before (T-I), during (T-II), and after the triboexperiment (T-III)**.** Time domains **td_exp** of the experimental progress for W1 and F1 in minutes versus start of the triboexperiment and average OCP values E(0) to E(5) obtained for the 1.4108 counter body material at these time domains (W1: in combination with MMC; HT1; HT2; SN1; SN2; F1: in combination with MMC; SN1; SN2 and polyphenolic resin Ref). Similar results are combined in groups A-D

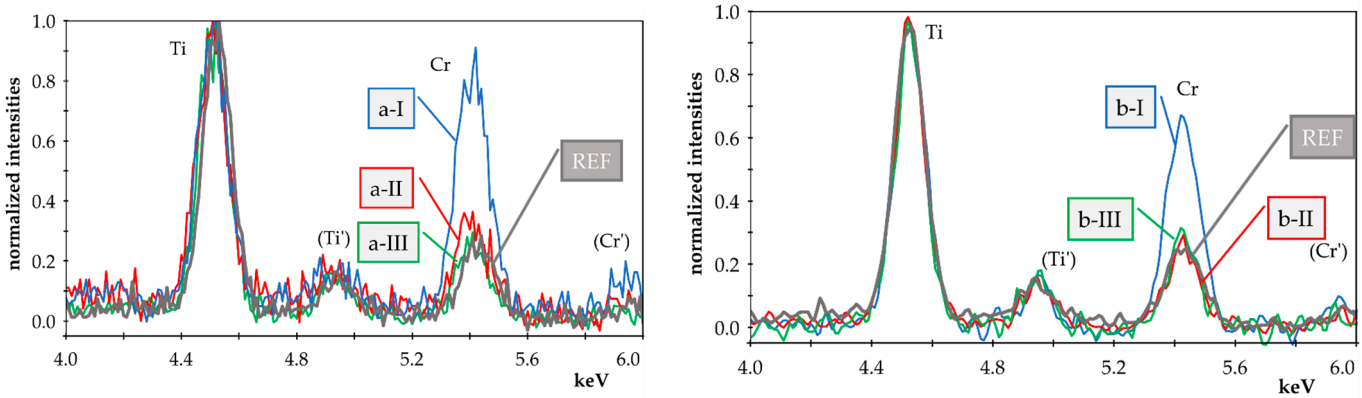
	Phase→	**T-I**	**T-II**			**T-III**	
Electrolyte		**td_exp / min**					
W1		–10	10	60	120	120+15	120+120
F1		–10	5	20	45	45+10	–
	Base body	**E(0)**	**E(1)**	**E(2)**	**E(3)**	**E(4)**	**E(5)**
	Material	**E / 10^{-3} V**					
W1	MMC	-50…+70	-125±10	-124±8	-135±5	-80±10	-16±12
	HT1		-89±7	-125±10	-135±10	-82±12	-39±16
	HT2		-95±10	-133±5	-139±6	-70±15	-38±15
	SN1		-190±20	-203±17	-200±15	-85±15	-22±42
	SN2		-180±10	-200±10	-215±10	-95±10	-20±5
F1	Ref	+60…+130	+80±12	+63±20	+60±25	+70±25 [1]	–
	MMC		+120±10	+140±20	+150±20	+120±40 [1]	
	SN1		+130±15	+138±12	+140±20	+100±40 [1]	
	SN2		+130±40	+115±20	+110±20	+105±35 [1]	

[1] Estimation; includes bias potential imposed by refilling of 1…2 ml of W1 after the triboexperiment.

Table S-1 summarizes numerically all OCP measurements performed with the different material combinations. Shown is the progress of 1.4108 potential on deliberate steps of the triboexperiment, marked chronologically by E(0) up to E(5). As an additional approach, materials are then collected into groups with corresponding behavior. Groups A–C identify materials and conditions with a trend to lower potentials while sliding. Group D identifies material behavior with a trend to higher potentials. With lubricant W1, the potential before contacting (phase T-I) was not fully repeatable. Within the triboexperiment advances (phase T-II), two different trends of OCP progress could be identified: The potential drop and its drop rate were higher for the tribosystem with ceramic materials (Group B) than for those with metallic base material (Group A). In this sense, in phase T-III, the potential at 900 s after the triboexperiment still complied with this observation. After 7,200 s, all 1.4108 potentials matched at comparable values.

With lubricant F1, Phase T-I behavior was likewise indifferent as with W1. In phase T-II, ceramics and MMC potentials of 1.4108 in contact with SN1 and MMC generally went to higher potentials. Against SN2 ceramic, the trend was more indifferent, leading to a higher scattering of the average potential values. For MMC, an obvious delay of the potential increase compared to SN1 could be recognized which might be due to the low friction. For this reason, MMC is added to a subgroup D1, while the ceramics fall in subgroup D2. Against the resin, the potential trend was slowly towards lower values (Group C). Therefore, mass transport limitations are not the reason for the evolvement of the potential curves. In fact, mixed potential formation between the materials and the mutual

contribution of anionic and cationic activity have at least the same impact on the potential as the dimensioning of the wear area.



(**a**) (**b**)

Figure S1. Complementary EDX spectra of the range 4,000–6,000 keV showing Ti and Cr abundance in measured areas (a) a-I to a-III shown in Figure 18a, (b) b-I to b-III shown in Figure 18b. EDX spectra acquired at positions b-I to b-III. All EDX peaks are base line corrected and normalized to Ti Kα at 4.5keV. REF is the spectra of a distant area outside of the respective wear area.