Depassivation–repassivation Behavior of a CoCrMo Alloy under Tribological Contact in Simulated Body Fluids

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doi: 10.20964/2017.03.67

Received: 5 January 2017 / Accepted: 30 January 2017 / Published: 12 February 2017

The long term performance of CoCrMo alloys in a tribocorrosive environment relies on the passivation properties of such alloys. The depassivation–repassivation phenomenon of CoCrMo alloy surfaces in a 0.9% NaCl solution, with and without the addition of Bovine Serum Albumin (BSA), was investigated. The relationships between the wear-induced-depassivation rate (D), applied load (F) and stroke frequency (f) were deduced. These can be summarised as $D = 7.57E-6F^{0.56}f$ in a 0.9% NaCl solution and $D = 2.31E-6F^{0.85}f$ in BSA containing solution. It was found that the ratio of the Cr element in the outer layer of the passive film was lower after depassivation. The passive film formed initially has better stability, which results in a lower depassivation rate in the initial few cycles compared with later cycles (relatively stable) in 0.9% NaCl solution. The adsorption of BSA and the effects of mechanical wear result in a higher depassivation rate in the initial a couple of cycles in BAS containing 0.9% NaCl solution.

Keywords: tribocorrosion; depassivation; repassivation

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