TRIBOLOGICAL BEHAVIOR OF POLYMER/METAL FRICTION PAIRS IN THE SIMULATED DEEP SEA

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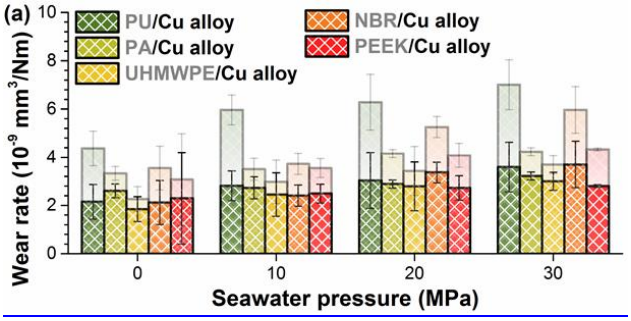
ABSTRACT
A tribometer simulating the deep-sea environment with elevated seawater pressures equivalent to 3500 m in ocean depth was established (Fig. 1)[1-3]. The tribological performance of polymer composites fabricated by polytetrafluoroethylene (PTFE), polyetheretherketone (PEEK), ultrahigh molecular weight polyethylene (UHMWPE) and polyurethane (PU) sliding against a C77000 Cu alloy counterface was estimated.

Fig. 1 A tribometer was used to simulate the deep-sea environment and was equipped with a seawater cycle loop and an electrochemical workstation.

The results showed that both the wear loss and friction coefficient increase with increasing seawater pressure but vary with different polymer counterparts (Fig. 2).



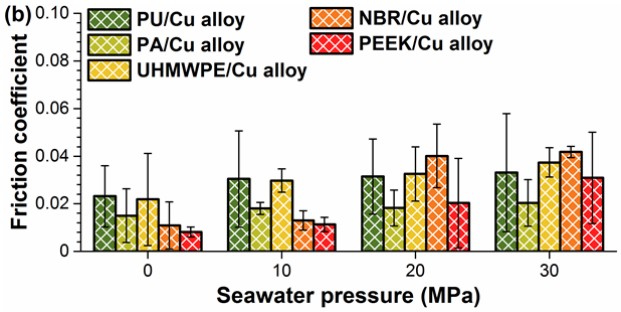


Fig. 2. (a) Wear rate and (b) friction coefficient of friction couples composed of polymer composites and Cu alloy.

The tribological performance was determined by the combined effects of polymer transfer and the tribocorrosion of the metallic counterpart (Fig. 3).

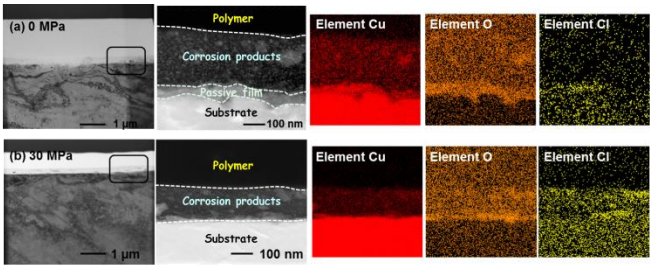


Fig. 3. The cross-sectional morphologies of metallic counterparts sliding against polyurethane at different seawater pressures of (a) 0 MPa and (b) 30 MPa.

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