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Effects of surface chemical groups and environmental media on tribochemical running-in behaviors of silicon surface

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Abstract

In order to offer insight into the removal of outmost silicon atoms, the various tribochemical running-in processes at the Si/SiO_2 interfaces were investigated. The running-in of $Si–SiO_x$ surface in humid air exhibited a transition from protrusion to groove. By contrast, the initial wear of Si–H surface began with a nearly wearless state in air and revealed apparent material removal after only one sliding cycle in water. The variations in wear rate and friction force suggested the changes of interfacial dangling bonds and energy dissipation. Not only the removal of native oxide layer but also the condensation of interfacial water molecules and the change of surface chemical groups were proposed to interpret the tribochemical running-in mechanisms of silicon surface.

Keywords: silicon surface; nanowear; running-in; tribochemistry