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Study of Tribological Behavior of Zirconium Alloy Against SS-410 at High Temperature

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Abstract : Zirconium alloys exhibit low neutron absorption cross-section and excellent mechanical properties. Due to these unique characteristics, these materials are widely used in designing core components of pressurized heavy water reactors (PHWRs). Another material that is widely used in the design of reactor core is stainless steel. Under operating conditions of the reactor, there are possibilities for mechanical and tribological interaction between the components made of zirconium alloy (Zr-2.5 Nb) and stainless steel (SS-410). This may result in wear of the material. To study the tribological characteristics of Zr-2.5 Nb and SS-410, low amplitude reciprocating wear tests are conducted at room temperature and at high temperatures (260 degrees Celsius). The tests are conducted at frequencies ranging from 5 Hz to 25 Hz. The displacement amplitude is varied from 200 µm to 600 µm. The responses are recorded, analyzed and correlated with damage observed using scanning electron microscopy (SEM) and an optical profilometer. Energy dispersive spectroscopy (EDS) is used to study the damage mechanism prevailing at the contact interface. A higher coefficient of friction (COF) is observed at higher temperatures as compared to the one at room temperature. Tests carried out at high temperature reveals adhesive wear as the dominant mechanism resulting in significant material transfer.

Keywords : PHWRs, Zr-2.5Nb, SS-410, wear
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