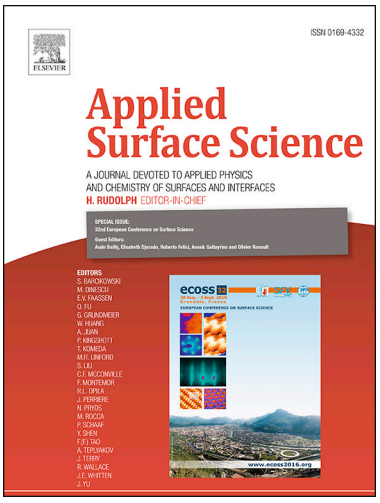

Full Length Article

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Tribochemistry of contact interfaces of nanocrystalline molybdenum carbide films

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Abstract

Transition metal carbides (TMC) are known for their improved tribological properties and are sensitive to the tribo-atmospheric environment. Nanocrystalline molybdenum carbide (MoC) thin films were deposited by DC magnetron sputtering technique using reactive CH_4 gas. The friction and wear resistance properties of MoC thin films were significantly improved in humid-atmospheric condition as compared to high-vacuum tribo-condition. A comprehensive chemical analysis of deformed contact interfaces was carried out using X-ray photoelectron spectroscopy (XPS), energy dispersive X-ray spectroscopy (EDX) and Raman spectroscopy. XPS and Raman spectroscopy showed the formation of stable molybdenum-oxide (MoO), molybdenum carbide (MoC) and amorphous carbon (a-C) tribo-phases. Moreover, during the sliding in humid-atmospheric condition, these phases were extensively deposited on the sliding steel ball counter body which significantly protected against undesirable friction and wear.

Keywords: MoC thin films; Chemical structure; Tribochemistry; Tribological properties.