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Zr-DLC coatings – analysis of the friction and wear mechanisms

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In the last few decades, the amorphous or nanostructured carbon structures prepared by several deposition techniques are a subject of considerable research interest due to their excellent properties, such as high hardness and chemical inertness, wear resistance or low friction. There have been also attempts to improve the mechanical, chemical or tribological properties of carbon coatings by addition of other elements. Generally, specific chemical composition of the modified films strongly affects the surface energy, and may modify various physical properties and decrease compressive stress, making some metal-doped carbon films suitable for large variety of practical applications, such as lubricated contacts or biomedical applications. Our work was focused on the structural, chemical and tribological properties of Zr-doped coatings with controlled composition. The main attention was paid to the determination of the predominant wear mechanisms, characterization of the worn surfaces and wear debris and formation of a tribolayer affecting the tribological process in various environmental conditions (elevated temperature, lubrication, corrosive solutions). The as-deposited coatings and worn surfaces were studied using 3D optical profilometry, Raman spectroscopy, XRD and SEM. It was showed that the wear processes taking place at the contact interface were significantly dependent on the testing conditions. Fundamental relations between as-deposited coating properties, wear track surface properties, tribolayer properties, and tribological tests conditions has been described.

Keywords
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