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Improving tribological properties of titanium alloys by combining laser surface texturing and diamond-like carbon film

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Abstract

Titanium alloys are characterized by poor tribological performance, and their conventional use has been restricted to non-tribological applications. Surface films and surface texturing are effective methods to improve the tribological properties of sliding surfaces. In this study, the patterns of micro-dimples with different densities and diamond-like carbon (DLC) films were fabricated on the surface of titanium alloy by laser surface texturing and magnetron sputtering, respectively. The effects of dimple densities and DLC phase transformation on the tribological behavior of the titanium alloy under dry friction and liquid lubrication conditions were investigated. The results showed that DLC film with appropriate dimple area density (44%) are effective in enhancing reducing-friction property of titanium alloy substrate because of the entrapment of wear particles in the dimples and dimple-induced graphitization

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