ORIENTATION BASED FRICTIONAL PERFORMANCE OF MICRO-GROOVE CROSS HATCHED TEXTURES FOR METAL-ON-CERAMIC HIP IMPLANT

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ABSTRACT

Surface texturing is the latest technology in bio-tribology field to improve tribological performance of an articulating interface. Texture produces micro-hydrodynamic pressure at the contact, acts as lubricant reservoir and also entraps onsite wear debris. Circular, elliptical and triangular texture shapes were investigated for improved tribological performance under conformal contact [1]. The influence of texture shape and geometrical parameters have also been investigated extensively to improve tribological performance [2]. The perpendicular and parallel orientation of micro-groove textures showed a significant impact on the tribological performance of sliding surfaces under different loads [3]. However, the influence of texture orientation still needs to be explored for micro-groove cross hatched textures to improve the tribological performance for hip implant application. Hence, this study investigates the tribological behavior of micro-groove cross hatched surface texture over Metal-on-Ceramic contacts with 0° and 45° texture orientations under bio-lubricated condition. Micro-groove cross hatched textures with 5µm depth and 25% area density were fabricated precisely over Ti6Al4V block samples using Laser Surface Texturing (LST) technique. 3D images of these textures with different orientation were obtained using non-contact type optical surface profilometer as shown in Figure 1. All the textured and untextured Ti6Al4V samples were tested for their friction and wear performance against cylindrical alumina pins for two different loads under bio-lubricated condition using linear reciprocating tribometer. Dimple texture with similar depth and area density was also fabricated and tested for the friction and wear performance using same testing conditions. Tribology results for micro-groove cross hatched and dimple textured samples will be statistically analyzed and compared with untextured samples. Worn-out samples were examined for their surface interaction and wear mechanism using Scanning Electron Microscopy (SEM).

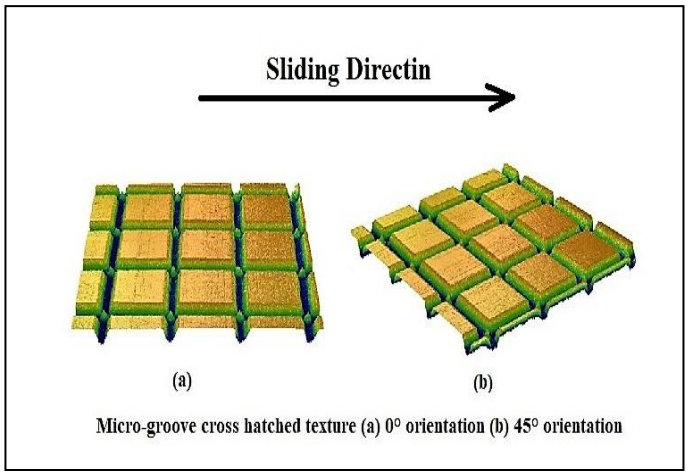

Fig.1 3D images of Micro-groove cross hatched texture with different orientations

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