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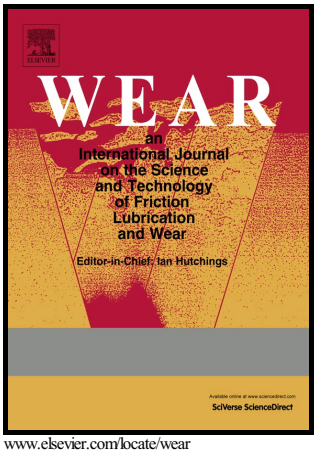

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Load-dependent run-in and wear behaviour of line-like surface patterns produced by direct laser interference patterning

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Abstract

Line-like patterns having periodicities of 6 and 9 µm as well a structural depth of 1 µm were created by direct laser-interference patterning on stainless steel substrates (AISI-304). Dry sliding tests using a ball-on-disk configuration were performed under dry sliding in order to study the run-in behaviour of these samples as a function of the applied normal load (0.5, 1, 10 and 15 mN) and the ball diameter (3 and 6 mm). The resulting wear tracks were examined by light microscopy, white light interferometry and scanning electron microscopy in order to study the underlying friction and wear mechanisms. Dependent on the applied normal load, clear differences in the frictional behaviour can be observed. For small normal loads (0.5 and 1 mN), the underlying friction and wear mechanism seems to be adhesion-dominated while for 10 and 15 mN, plastic deformation and abrasion are the most important contributions. It could be shown that, for small normal loads, the surface pattern with a periodicity of 6 µm leads to a significant reduction of the initial and final COF by a factor of roughly 2 and 4, respectively. Regarding the wear performance, no beneficial effects of the laser-patterning could be observed.

Keywords: Laser surface patterning, dry friction, run-in behaviour, sliding wear

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