

Tribological evaluation of vegetable oil/MoS₂ nanotubes-based lubrication of laser-textured stainless steel

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In the present work, functionalization of AISI 316L surfaces by nanosecond Nd:YAG laser texturing in order to modify the surface morphology with crosshatch and dimple patterns is presented. Tribological analysis under lubrication with sunflower and jojoba oil with and without addition of solid lubricant, MoS₂ nanotubes, was performed. In connection to friction/wear response laser-textured surface wettability, oil spreadability and oil retention capacity were analysed. It was shown, that the crosshatch pattern generally exhibited lower friction than the dimples pattern, with the addition of MoS₂ nanotubes not having any significant effect on the coefficient of friction under the investigated contact conditions. This was additionally with better oil spreadability and oil retention capacity results of crosshatch textured surface. Furthermore, texturing reduced wear of the stainless-steel surfaces but led to approximately one order of magnitude larger wear rate of the steel counter-body, primarily due to the presence of hard bulges around the textured patterns. Overall, the crosshatch pattern showed better oil retention capacity and lower friction in combination with different vegetable oils, thus making it a promising choice for improving tribological performance in various environmentally friendly applications.