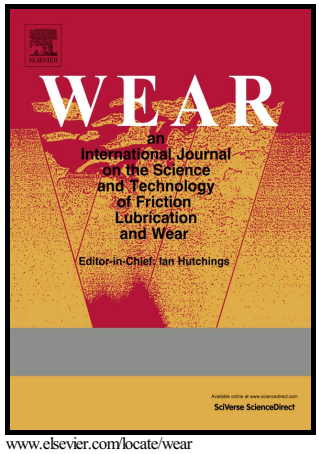

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Effect of cathodic hydrogen charging on the wear behavior of 5754 Al alloy

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Abstract

This research work is focused on investigating the effect of hydrogen uptake on the structural and tribological properties of 5754 Al alloy. The aim is to understand the synergism between hydrogen uptake and wear. In particular, hydrogen was incorporated into the surface via galvanostatic polarization in a 3 M HCl aqueous solution. The incorporation of hydrogen into the surface layers of that alloy and for the selected charging conditions, led to blistering. Aluminum hydrides were not detected by X-ray diffraction in the hydrogen charged samples, but the hydrogen content in the surface layers was quantified by elastic recoil detection analysis. A hardening of surface layers after hydrogen incorporation was observed. The sliding wear resistance of that alloy against an alumina countermaterial was found to vary considerably, depending on the hydrogen charging conditions, the synergetic effect between hydrogen charging and friction, and the formation of a tribolayer at the contacting interface.

Keywords: Aluminum alloys, Hydrogen embrittlement, Sliding wear, Hydrogen charging, Surface properties

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