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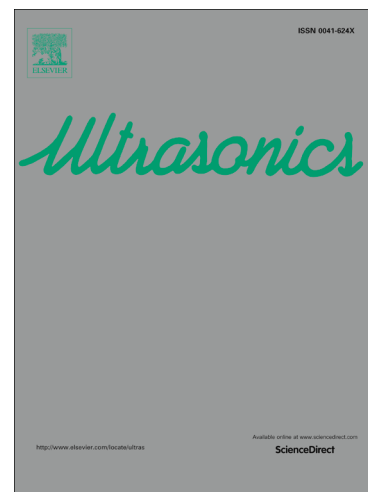
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Optimization of USSP duration for enhanced corrosion resistance of AA7075

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Abstract

This investigation was carried out following our earlier work on the effect of ultrasonic shot peening (USSP) on corrosion resistance of the 7075 aluminium alloy in 3.5wt% NaCl solution to optimize the duration of USSP. The un-USSP treated and different USSP treated samples were subjected to potentiodynamic polarization and electrochemical impedance spectroscopy. Among the specimens USSP treated from 5 to 30 seconds, the one USSP treated for 15 seconds (USSP 15) was found to exhibit highest corrosion potential (E_{corr}) and lowest corrosion current density (i_{corr}). Corrosion products were characterized by Scanning Electron Microscopy (SEM) and X-ray Photoelectron Spectroscopy (XPS). Scanning Kelvin Probe Force Microscopy (SKPFM) was used to measure the surface free potential. The enhanced corrosion resistance of the USSP 15 sample was found to be due to combined effect of surface nanostructure of the matrix, homogeneity and refinement of second phase precipitates. There was enhancement in formation of adherent passive layer in the USSP15 specimen.

Keywords: Nanostructure, Ultrasonic Shot Peening, TEM, SEM, Polarization, EIS.

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