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SIZE-DEPENDENT TIN NANOSTRUCTURE COATING DEPOSITED BY THE PACVD METHOD WITH CORROSION BEHAVIOR

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Abstract

This paper evaluates the corrosion resistance of duplex treated AISI H11 tool steel. The duplex treatment involves cold wall plasma nitriding, TiN nanostructure coating, and plasma assisted chemical vapor deposition (PACVD). Plasma nitriding was carried out in a chamber including 25 vol. % N2 and 75 vol. % H2 at 500˚C for 4 h. PACVD treatment was performed in the same chamber containing Ar, N2, and H2 gases along with TiCl4 vapor for 4 hours at a chamber pressure of 3 mbar, for different process temperatures of 470, 495, and 520 ˚C. Scanning electron microscopy (SEM), atomic force microscopy (AFM), surface roughness, and potentiodynamic polarization in 3.5% NaCl solution were used to study the samples. The results indicate that samples coated with TiN in lower temperature exhibit a 10 fold improvement in corrosion resistance relative to the coated samples in higher temperature. Furthermore, this study demonstrates that surface roughness increases by raising the deposition temperature of the PACVD treatment from 470 °C to 520 °C, leading to a lower corrosion resistance of the coated samples.