

Mechanical and Electrochemical properties for SiC_xN_y coating as a function of nitrogen content

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Amorphous silicon carbon nitride ($\text{a-SiC}_x\text{N}_y$) coatings were prepared on boron-doped silicon and 304 stainless steel substrates by high-power pulsed magnetron sputtering system. Employing the structural and chemical analysis by XRD, XPS(X-ray photoelectron spectroscopy), FE-EPMA(Field Emission-Electron Probe Micro-Analyser) and Raman spectroscopy, it was possible to determine that this coating presents a structure formed by an amorphous zone ($\text{a-SiC}_x\text{N}_y$). The $\text{a-SiC}_x\text{N}_y$ coating with 23.3 at.% N demonstrates a hardness value of 21.7 Gpa. The friction coefficient of the coating with a high C–C bond content against a WC ball is as low as 0.07. The electrochemical behaviors of the deposited coatings in 3.5 wt.% NaCl solution were studied by using potentiodynamic polarization, electrochemical impedance spectroscopy, OM and SEM. The results show that the coated 304 stainless steel displays a better resistance to uniform and pitting corrosion than the bare material.

Keywords: SiC_xN_y , HiPIMS, Electrochemical properties, Amorphous

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