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Abstract

The TiSiCN coating was fabricated on Ti6Al4V alloy by arc ion plating. The structure of the TiSiCN coating was characterized using Scanning electron microscopy, X-ray diffraction, X-ray photoelectron spectroscopy and Transmission electron microscopy. The hardness and tribological properties of the TiSiCN coating were evaluated by nanoindentation and ball-on-plate wear tests. The coating has a coupled structure of the TiCN nanocrystal and amorphous phase (Si_3N_4 and SiC). The TiSiCN coating has a super high hardness of 43.6 GPa and modulus of 422 GPa. The values of H/E and H_3/E_2 are 0.103 to 0.465, respectively. The coating has a low friction coefficient of 0.3, and the wear loss is 1.76×10^{-6} mm^3/Nm, which is only 1/3 of wear loss of the TiSiN coating. The TiCN phase contributes to significantly decrease of the friction coefficient and wear rate for the TiSiCN coating.

Keywords: TiSiCN coatings; Arc ion plating; Structure; Hardness, Tribological behavior