
Effects of pulsed bias on TiCN coatings by hybrid deposition of arc ion plating and magnetron sputtering

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Abstract

Hybrid deposition, consisting of arc ion plating and magnetron sputtering, is employed to fabricate TiCN films on high speed steel substrates, where a Ti target is evaporated by arc and a carbon target is sputtered simultaneously. The influence of pulsed bias, superimposed with a fixed direct-current bias and applied to the substrates, was investigated in terms of the microstructure and mechanical properties of the as-deposited films. X-ray diffraction (XRD), scanning electron microscopy (SEM) and atomic force microscopy (AFM) were adopted to characterize the microstructure and morphology. Hardness and elastic modulus of the films were measured by a Vickers tester. A tribo-meter is used to characterize the tribological properties. XRD data show that the films are crystalline under different biases. The surface quality of the films by the hybrid deposition is improved with respect to that of the films deposited by only arc ion plating. High hardness of TiCN indicates that the mechanical properties of the films can be enhanced by hybrid ion plating. The effects of pulsed bias on the structure and mechanical properties of the TiCN films have been investigated and discussed.

Keywords: Pulsed bias, Arc ion plating, Magnetron sputtering, Hybrid deposition, TiCN film

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