

Microstructure and Mechanical Properties of Diamond-like Carbon Coating on Martensitic Stainless Steel

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Abstract

SUS 440C martensitic stainless steels (16Cr-1C) coated with diamond-like carbon (DLC) by arc ion deposition were studied. The technology of surface modification can provide the better surface characteristics and wear resistance, especially higher hardness. The microstructure of DLC coatings were observed by optical microscope and field-emission scanning electron microscope (FE-SEM). The compositional depth profile of DLC films were measured by field-emission Auger electron spectroscopy (FE-AES). The micro-hardness and elastic modulus of DLC films were measured by nanoindenter. Experimental results show the total thickness of DLC coatings were about 600nm to 1100nm. The microstructural observation shows that DLC film has a 440C/Ti/TiC/DLC layer structure. The micro-hardness was measured in the range from 24.2GPa to 26.0GPa, and the elastic modulus was measured in the range from 264GPa to 313GPa. The nanoscratch results show that DLC films have lower friction coefficients than 440C steel substrates.

Keyword : diamond-like carbon, arc ion deposition, nanoindenter, martensitic stainless steel