Tribological properties of diamond-like carbon coatings deposited using unbalanced magnetron sputtered with various tungsten filament currents

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Abstract

The diamond-like carbon coatings were deposited on AISI M2 steel disks using an unbalanced magnetron sputtering technique with a single titanium metal target, three graphite targets and mixed acetylene/methane reactive gas. The various currents (9A-17A) were applied to the tungsten filament to enhance ionization rate of reactive gas. Tribological properties of diamond-like carbon coatings were conducted used reciprocating friction tester. The results show that the tungsten filament current has a significant effect on the deposition rate, hardness and tribological properties of the coatings. With the increase of the tungsten filament current, the deposition rate and hardness of the coating increases, respectively. In sliding against an AISI 52100 steel ball for 24 minutes, all of coatings reduce the wear depth by a factor of at least 11 compared to that observed on an uncoated substrate The 17A coating yields the best tribological properties that are the minimum wear depth, the lowest friction coefficient and the maximum lifetime when sliding against an AISI 52100 steel ball or Al2O3 ball.

Keywords: Diamond, like carbon, Tribological properties, Filament

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