

Thermal Stability of Ternary Ti-Si-N Coatings

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ABSTRACT

In this work, ternary Ti-Si-N coatings with varying composition have been produced by combined DC/RF reactive unbalanced magnetron sputtering. By adjusting the RF power applied to the Si target, Si content in the film varies from 0 to 13.5%. Annealing is carried at 600, 700 and 800°C for these samples with varying Si composition. Thermal stability, in terms of composition change and crystallite size, are characterized and compared with a reference binary TiN coating. The oxidation resistance of the Ti-Si-N coatings is found to be better than that of TiN. Coatings containing more than 5.0 at% Si have shown good resistance to oxidation, while the TiN coating has been completely oxidized after the 700°C annealing. After the heat treatment at all three temperatures, the average TiN crystallite size in the Ti-Si-N coatings with higher silicon content (≥ 5 at% Si) remain largely unchanged, which indicates that no crystallite coarsening occurs during the heat treatment.

Keywords: Thermal Stability, Oxidation Resistance, Crystallite Size