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Physical and tribological properties of sputtered silicon-containing carbon coatings at high temperatures

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Sputtered carbon coatings have excellent tribological properties, such as high wear resistance and low friction at room temperature. In a number of end-use applications, there is a need to extend these properties to higher temperatures. It has been shown that inclusion of silicon in the coating can extend the working temperature of sputtered carbon coatings [1,2]. This work focuses on evaluating the high temperature performance of carbon coatings with varying silicon contents. Differential scanning calorimetry was used to study the transition temperatures in the coatings, hence establishing the working temperature range for each coating. High-temperature tribological tests evaluated the mechanical performance. The effect of silicon addition on the structure of coating was investigated using Raman spectroscopy. Increasing the silicon content improved the thermal stability of the coatings and shifted the oxidation to higher temperatures. It also affected the wear properties. The optimum silicon content and deposition parameters were established to obtain the required performance. The optimum coating showed excellent low friction properties at 325 °C. References:

[1] O. Jantshner et al. Tribology Int. 77 (2014) 15-23

[2] O. Jantshner et al. Acta Materialia 82 (2015) 437-446

Keywords

Magnetron sputtering

Graphitic carbon

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