

Effects of nano-TiC content on morphology, hardness and tribological properties of Ni/TiC nanocomposite coatings

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In order to increase the hardness, reduce the friction coefficients and further improve the wear properties of pure Ni coatings, Ni/TiC nanocomposite coatings were prepared on the surface of stainless steel by electrochemical co-deposition process. The effects of TiC nanoparticles content on the morphology, composition, hardness and tribological properties of the Ni/TiC nanocomposite were investigated compared to pure Ni coatings. The surface morphology and the composition of coatings were characterized by scanning electron microscopy (SEM) with energy dispersive analyzer system (EDX). Taking in consideration the SEM morphologies, it was found that the presence of TiC nanoparticles change the crystallizations of nickel matrix to smaller and thinner crystallites. The EDX analyzes proved the inclusion of TiC nano-particles into nickel matrix. By comparatively nanoidentation technique it was found that Ni/TiC nanocomposite coatings exhibit improved nanohardness as compared with pure nickel coatings. The wear behaviour of the pure Ni and Ni/TiC nanocomposite coatings were evaluated using a ball-on-flat fretting set-up, by applying different loads. The results show that the addition of TiC nano-particles into to the Ni matrix may greatly reduce the friction coefficients (Fig. 1) and improve the wear resistance compared with pure Ni coatings.

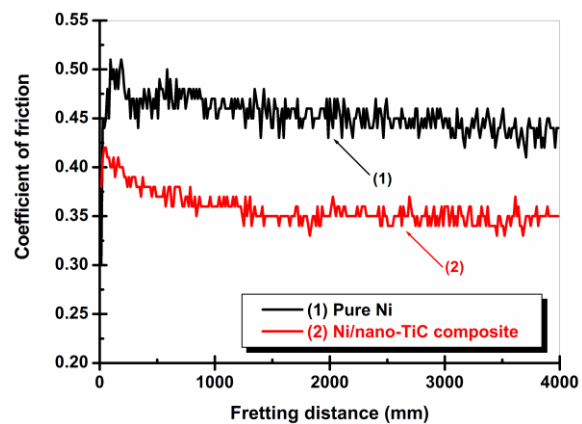


Fig.1 Friction coefficient of (1) pure Ni and (2) Ni/nano-TiC coatings, during fretting tests performed in dry conditions at the normal force of 1 N, 1 Hz fretting frequency, 200 μ m displacement amplitude, 10000 fretting cycles.