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Influence of Ti interlayer to adhesion and dynamic wear resistance of nc-TiC/a-C:H coatings prepared by DCMS and HiPIMS

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Nanocomposite coatings consisting of TiC crystallites embedded in hydrogenated amorphous carbon matrix (nc-TiC/a-C:H) exhibit unique combination of high hardness and low friction. The aim of the present work was to study adhesion and dynamical wear resistance of this coatings deposited on tungsten carbide substrates.
The nc-TiC/a-C:H coatings were prepared using hybrid PVD-PECVD process of sputtering Ti target in argon/acetylene atmosphere. Two series of coatings with different content of carbon were prepared using both DCMS and HiPIMS. Chemical composition and microstructure of coatings were determined using XRD, XPS and EDX analyses. Nanoindentation test was used to determination of the hardness and elastic modulus. Coatings adhesion was determined using scratch tester with cone tip. To evaluate impact resistance of the coatings, an impact test with WC ball was used.
Adhesion of the DCMS prepared coatings exhibited local maximum at approx. 60 at. % of C, adhesion of the HiPIMS prepared coatings continually increased with increasing carbon content. The DCMS coatings under repeated dynamical impact load exhibited different behaviour than the HiPIMS coatings. Differences in the adhesion as well as in the impact wear resistance of the DCMS coatings and the HiPIMS coatings are discussed with respect to the coatings and adhesive interlayer microstructure and mechanical properties.
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