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The influence of deposition conditions and bilayer thickness on physical-mechanical properties of CA-PVD multilayer ZrN/CrN coatings (Article)

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Краткое описание

ZrN/CrN multilayers have been produced by a cathodic arc technique (CA-PVD) using different depositions conditions. Microstructural and mechanical characterizations of the coatings were performed by X-ray diffraction (XRD), scanning electron microscopy with energy dispersive spectroscopy (SEM with EDS), transmission electron microscopy (TEM), and Vickers microhardness tests. Variations in thermal transformation properties due to heating within the temperature range from 30 °C to 1400 °C were studied by differential scanning calorimetry (DSC) measurements. SEM and TEM observations showed that the coatings comprise a multilayered structure with nanometric grains. EDS spectra confirmed the formation of stoichiometric composition. Near-to-super stoichiometric nitrides can be suggested in certain specimens. Results of the XRD analysis revealed that the (200) and (111) planes for ZrN and Cr 2 N are the most intense. Calorimetric tests showed that below a certain annealing temperature no transformations were defined. 1180 °C was found to be the value where only one-stage state transformation, presented by endothermic or exothermic reactions, took place. The highest hardness (4685HV0.025) was obtained for the coating with Λ = 140 nm, P N = 0.43 Pa, U S = −70 V. © 2018