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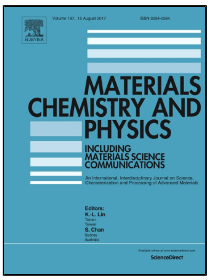

Effects of CH_4 flow ratio on the structure and properties of reactively sputtered (CrNbSiTiZr)C_x coatings

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Abstract

High-entropy (CrNbSiTiZr)C_x coatings were successfully fabricated by reactive radio-frequency magnetron sputtering using an equimolar CrNbSiTiZr alloy target under CH_4-containing Ar flow. The effect of the CH_4 flow ratio on the chemical composition, microstructure, mechanical and tribological properties of (CrNbSiTiZr)C_x coatings was investigated. The carbon content in the coatings varied from 36.7 at% to 87.8 at% with an increasing CH_4 flow ratio from 3% to 20%. The (CrNbSiTiZr)C_x coatings revealed a simple NaCl-type FCC (face-centered cubic) structure. The maximum hardness of 32 GPa was obtained at the carbon content of 36.7 at% by applying substrate bias of −100 V. On the other hand, the coating with high carbon content of 87.8 at% possessed superior wear resistance, which friction coefficient and wear rate were, respectively, 0.07 and 2.0×10^{-7} $mm^3/N \cdot m$.

Keywords: Physical vapor deposition; High-entropy alloys; Coatings; Mechanical Property; Wear.