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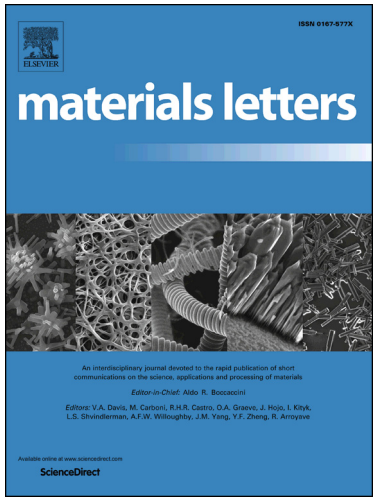

Structural and mechanical characterization of (TiZrNbHfTa)N/WN multilayered nitride coatings

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PII: S0167-577X(18)31080-2
DOI: https://doi.org/10.1016/j.matlet.2018.07.048
Reference: MLBLUE 24614

To appear in: *Materials Letters*

Received Date: 19 April 2018
Revised Date: 2 July 2018
Accepted Date: 11 July 2018

Please cite this article as: A.A. Bagdasaryan, A.V. Pshyk, L.E. Coy, M. Kempiński, A.D. Pogrebnjak, V.M. Beresnev, S. Jurga, Structural and mechanical characterization of (TiZrNbHfTa)N/WN multilayered nitride coatings, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.07.048

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Abstract

The (TiZrNbHfTa)N/WN multicomponent coatings were deposited by vacuum arc evaporation under different substrate bias (-90 and -280 V). X-ray photoelectron spectroscopy was used for analyzing of complex composition of investigated coatings by reflecting of atomic scale chemical interactions. The structural investigations showed the formation of a simple disordered solid solution in (TiZrNbHfTa)N layer, β-W_2N phase in WN layer with fcc crystal structure and highly disordered bcc (110) and (220)-oriented high-entropy alloy phases, regardless of the applied bias potential. It was shown that with increasing of substrate bias from -90 to -280 V, there is a slight decrease of hardness from 34 to 31 GPa and increase of Young's modulus from 325 to 337 GPa, which can be explained by annihilation of point defects and precipitation of relatively softer metallic phase.

Key words: multilayer structure, chemical bonding, solid solution, mechanical properties