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# Structure, tribomechanical properties and radiation tolerance of nanostructured (TiHfZrVNb)N coatings

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We performed studies of the (TiHfZrVNb)N coatings based on high-entropy alloy (HEA) irradiated with 500 keV $He^+$ ions. These high-entropy systems are of great interest due to their unique mechanical properties [1, 2]. Also, these coatings can serve as new radiation resistant materials. The coatings were obtained using cathode vacuum-arc evaporation. Irradiation by $He^+$ ions with an energy of 500 keV in the range of fluences from $5 \cdot 10^{16}$ to $3 \cdot 10^{17}$ ion/sm$^{-2}$ was performed. The depth distribution of atomic species in the deposited layers was measured by Rutherford backscattering spectrometry (RBS). Structural properties of coatings were studied by means of scanning electron microscopy (SEM). X-ray diffraction (XRD) was applied in order to study phase composition and to determine the grain size of formed coatings. To find the hardness, friction coefficient and wear resistance, the tribomechanical tests were performed. According to the results obtained, the following conclusions were made. High entropy of the deposited systems can stabilize the formation of a single-phase state in the form of a disordered solid solution and prevent the formation of intermetallic compounds during solidification. Nanostructured (TiHfZrVNb)N coating are radiation tolerant and perspective for nuclear fuel claddings.

References

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