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Thermal and Mechanical Properties of (W,Zr)B_{2-z} Coatings Deposited by RF Magnetron Sputtering Method

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W-Zr-B films with different stoichiometric ratio Zr/W were deposited by RF magnetron sputtering on silicon and tungsten carbide substrates. The coatings were deposited from plasma spark sintered targets using one-inch sputtering cathode. The impact of zirconium content on the film mechanical and thermal properties were investigated. Nano-indentation test was performed to analyze the hardness, Young modulus and subsequently flexibility of the films. It is shown that α-WB_2 magnetron sputtered coatings alloyed with zirconium content 0 ÷ 24 at% are superhard and in all investigated compositions possess similar hardness. In the same time Young modulus is decreasing about 10% what make deposited films more flexible. Obtained W-Zr-B films represent a new class of coatings which are simultaneously superhard H = 43±3 GPa, exhibit high values of the hardness and effective Young's modulus E* ratio H/E* >0.1, elastic recovery W_e > 60%. The results of thermal studies i.e. thermal shocking, annealing in vacuum and TGA show that deposited coatings are thermally stable at least to 800 °.

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