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Mechanical and Structural Studies of Ternary Mo–Zr–N Layers Deposited on Substrate by PVD

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Our study of ternary Mo–Zr–N thin layers is novel with the objective of improving certain mechanical and tribological characteristics and of finding the appropriate stoichiometry to have the microstructure, which orientates to the desired properties, using the characterization techniques: SEM, XRD, EDS, XPS, WDS and similar methods as well as nanoindentation, alternative tribometry and scratch test. The morphological study of ternary Mo–Zr–N coating shows that the (111) orientation of texture is preferred essentially due to residual internal stresses. During the development of the Mo–Zr–N deposits, we have noticed that the addition of Zr results in multiphases consisting of binary ZrN, MoN and MoZrN nitrides with a prism-shaped structure. The coefficient of friction is low for Mo–N coating and low zirconium levels. The Young's modulus takes values almost very close that is indicated for values below 100 at.% of Zr. The crystalline structure does not affect the resistance capacity of the material. The introduction of zirconium particles destabilizes the compound because zirconium atomic radius (0.138 nm) is higher than that of molybdenum (0.126 nm), and the lattice is distorted that explains these residual stresses.

Keywords: microstructure, morphology, texture, hardness, Young's modulus, covers, PVD.

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