

Élaboration par pulvérisation cathodique magnétron de couches minces en vue de leur utilisation comme biomatériaux. Caractérisation à l'usure et à la corrosion

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Abstract: The design and development of biomaterials with multifunctional surfaces by magnetron sputtering is the final objective of this work. Different mechanical and structural properties of the films obtained in monolayers (ZrN and Ta) and in multilayers (Ta / ZrN) were determined and analyzed. Investigative tools were X-ray diffraction (DRX), optical microscopy (OM) and scanning electron microscopy (MEB) and atomic force microscopy (AFM). Mechanical properties such as nanoindentation, stress measurements and adhesion tests were also carried out. The tribological and electrochemical performances of the different coatings were analyzed and compared. The Ar / N₂ + O₂ ratio in the plasma shows a negative influence of the O₂ on the performances in wear and corrosion of ZrN. Less oxygen leads to better results. The results obtained on multilayer ZrN/Ta coatings with different thicknesses show that they have intermediate properties to those of the monolayers that constitute them. Mechanical and tribological properties, low coefficient of friction of the Ta layer and good wear resistance of the ZrN layer. The M2 multilayer coating (ZrN/Ta) having the thickness of the layers which decreases with the increase in the number of periods has the best mechanical characteristics highlighted by scratch test and nanoindentation.

Keywords : Biomaterials, PVD, tribology, corrosion