CHARACTERIZATIONS OF NITROGEN-DOPED TITANIUM DIOXIDE FILMS PREPARED BY REACTIVE MAGNETRON SPUTTERING DEPOSITION

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Titanium dioxide (TiO_2) and N-doped TiO_2 films are very promising for applications as photocatalysts and bio-implants coatings due to their appropriate properties [1]. TiO_2 films can be fabricated by reactive magnetron sputtering method. The question about phase composition of deposited coating arises as TiO2 has three crystalline forms: anatase, rutile, and brookite. Anatase is known as an effective material for photocatalysis, whereas rutile is more chemically stable in the solutions and can improve the biocompatibility of implants.

This work presents the research results of the structural and phase change of TiO_2 films deposited by reactive magnetron sputtering at various modes: different working gases ($Ar+O_2+N_2$) and bias. The structure of the films was characterized by X-ray diffraction, Raman spectroscopy, and XPS surface analysis.

The data demonstrate that the main phase of the films is TiO_2 despite the presence of nitrogen in its composition. Nitrogen incorporation initiates the increase of rutile volume fraction from 38 % to 68 % in the films during their growth. N-doping (like bias) acts on the microstructure of the films. The grain structure is crushed. Analysis of the results is carried out in the frame of the structure zone models (SZMs) which systematically categorize self-organized structural evolution during physical vapor deposition as a function of film growth parameters.

Keywords: *Magnetron, Sputtering, TiON films.*