MAGNETRON SPUTTERED TiO_X LAYERS: STRUCTURAL, ELECTRICAL, OPTICAL AND THERMOCHROMIC ASPECTS

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Titanium oxide layers were prepared by sputter deposition with plasma emission monitoring in the whole stoichiometry range between Ti and TiO_2 without and with substrate heating to 240 °C. The layers were characterized with regard to their crystal structure and specific resistance. Optical constants were determined in the spectral range between 240 nm and 38 µm by minds of spectral ellipsometry. The thermochromic behavior of a prepared Ti_2O_3 layer was measured and compared to calculations for bulk material.

Sub-stoichiometric titanium oxides and oxynitrides are used as absorber materials for solar thermal collectors [1]. But although a variety of thin film deposition techniques have been reported for the titanium-oxide system, infrared optical properties for these coatings were rarely determined. In recent years additional interest in thermochromic absorber layers has risen, especially for the infrared region as thermochromic absorbers are used to lower the collector stagnation temperature [2]. The Ti_2O_3 material comprising a switching temperature between 130 °C and 200 °C is a potentially interesting candidate for this application [3]. So the scope of this paper is to link the deposition parameters for sputtered titanium oxide layers to their morphology and optical constants, with special interest in the thermochromic phase Ti_2O_3 [4].

Keywords: solar thermal collector; titanium oxide; thermochromic absorber

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