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### WO<sub>3</sub> THIN FILMS PREPARED BY PULSED PLASMA AND THEIR CHARACTERIZATION

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Tungsten oxide is an important material with electrical and optical properties that are exploited for a variety of applications such as photolysis, electrochromic devices and gas sensors. Tungsten trioxide (WO<sub>3</sub>) is an indirect bandgap semiconductor with attractive electrical and optical properties. The present work deals with photoelectrochemical properties of the layers prepared by magnetron sputtering deposition. The layers were prepared on FTO glass substrates (fluoride-doped tin oxide) at various deposition conditions. A high-power impulse magnetron sputtering (HiPIMS) system was used for the deposition of WO<sub>3</sub> thin films. Tungsten target was reactively sputtered in atmosphere of Ar + O<sub>2</sub> at constant gas pressure  $p = 2.18$  Pa. Properties of deposited WO<sub>3</sub> films were studied in dependence on pulsing frequency and applied impulse power. Crystallographic structure of the films was determined by XRD, the thickness of the layers was determined by profilometry and the surface morphology by SEM. The photoelectrochemical properties were measured in a Pyrex three-compartment cell with xenon lamp as solar simulator AM 1.5 G using three electrode arrangement (WE - FTO glass/ WO<sub>3</sub>; CE - Platinum mesh; RE - Ag/AgCl in 3M KCl). 0.1M Na<sub>2</sub>SO<sub>4</sub> was used as an electrolyte.

Layers calcined at temperature 450 °C have an increase of roughness, because of the growth of crystalline phase of WO<sub>3</sub>. Results of Raman spectroscopy of the WO<sub>3</sub> thin layers shows that as deposited layers (not calcined) are amorphous. Linear voltammetry of the calcined WO<sub>3</sub> thin films (450 °C) was measured using solar simulator AM 1.5 G as a light source. Films prepared at frequency 66 Hz (HiPIMS) and 40 kHz (pulsed) show the highest photocurrent values. Due to the amorphous phase of uncalcined layers these do not show photocurrent. Layers calcined at temperature 450 °C and prepared at frequency 66 Hz (HiPIMS) and 40 kHz (pulsed) show the highest photocurrent values.

#### Keywords

Tungsten oxide  
Thin film  
HiPIMS  
Pulsed plasma