

Calcination Condition Dependence of Electrical Properties of Fluorine doped Tin Oxide (FTO) Transparent Thin Films

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Abstract

In this study, dependence of optical and electrical properties of FTO thin transparent film on calcination conditions (thermal treatment in an oven in aerobic and anaerobic conditions, specifically, in the presence of either air or N₂ gas) were studied. The FTO films were fabricated with low cost home-made spray pyrolysis setup and calcinated at 500 °C for two different environments for thirty minutes. The homogeneous solution of stannous chloride (SnCl₂·2H₂O) and ammonium fluoride (NH₄F) in distilled water was used as a precursor solution. The films' structural, surface, optical and electrical properties were measured with XRD, SEM, UV-Vis spectroscopy, and 2-Probe measurements, respectively. The FTO films fabricated by spraying the precursor solution for 30 minutes with F to Sn ratio of 0.85:1.81 and calcined in the presence of air followed by low temperature plasma treatment yielded the lowest electrical resistance of 17 Ωcm⁻¹ and maximum transmittance of ca. 80 %. Also, the effect of calcination environment and plasma treatment on film's reflectance will also be discussed.

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Biography

Dr. Bhim Kafle, (Ph.D. in physics), now is an Assistant professor of physical chemistry at Kathmandu University (KU), head of the Material Science Research Laboratory (MSRL, KU) and a life Member of the Chemical Society of Nepal. He got his B Sc (with physics, chemistry and math as majors), M Sc in Physical Chemistry (Tribhuvan University, Nepal) and also in Solar Energy and Environmental Science (Ben-Gurion University, Israel), Specialist in photochemistry, Doctor's

degree (Ph.D.) at Graduate University for Advanced Studies (GUAS, Japan), got "The World Academy of Science (TWAS)" Award in 2012, and a best poster presentation Award from "Electrostatic Storage Devices Workshop (ESD-2011)", US, 2011. Currently Dr. Kafle's researches focus on the Spectroscopy of sensitizers for dye sensitized and perovskite solar cells and thin film preparation techniques.

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