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Surface morphology and structural properties of iron oxide thin film photoanode prepared by dip coating: effect of electrochemical oxidation

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Metal oxides have attracted a considerable attention as transparent electrodes, active layers and charge collectors in energy harvesting activities due to their diverse properties [1]. Due to its a nearly ideal band gap (˜ 2.1 eV) for solar energy conversions, low cost, chemical stability, natural abundance, n-type conductivity, "rust"- iron oxide (α-Fe2O3) - is regarded as a promising semiconductor in photovoltaic (PV) solar cells and photoelectrochemical (PEC) cells [2]. However, despite the good characteristics α-Fe2O3 absorbs weakly and conducts poorly due to poor carrier transport and rapid recombination of photo-generated electrons and holes. Surface morphology and structural properties strongly influences photoactivity efficiency of nanostructured electrodes [3]. α-Fe2O3 thin films were prepared by dip-coating method on fluorinated tin oxide (FTO) conductive glass substrates from Fe (NO3)3•9H2O (28.0 g) and oleic acid (17.0 g) precursor. Four layers of hematite films were obtained after repeated dip coating and annealing at 500 ° C for 2 hours. The photoanodes were electrochemically oxidized (anodized) in 1M KOH at a constant anodization potential of 500 mV for 1 min in dark and light conditions. The structural properties of α-Fe2O3 nanoparticles were investigated.
2. Results
Fig 1 shows top view images of high resolution FE-SEM of pristine and anodized α-fe2O3 thin film photoanodes. The nanoparticles were spherical in shape. The micrographs depicts a denser surface after electrochemical oxidation of photoanodes in light. Fig 2 XRD diffractograms of the films. The results show decrease in linewidth of the peaks in anodized samples which indicates increase in crystallite sizes upon the treatment.

Are you currently a postgraduate student? (Yes/No)

YES

At what level of studies are you currently? (Hons/MSc/PhD)

PhD

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