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## Influence of coating techniques on the structural and optical properties of $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanostructures

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### Abstract

In this study, hematite ( $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>) thin films were synthesized, on fluorine-doped tin oxide (FTO) glass substrates, using dip coating and spray pyrolysis. This was done to study the morphological, optical and structural properties of the hematite. Six peaks were identified from X-ray diffraction (XRD) measurements: (012), (104), (110), (024), (122) and (124). The (104) and (110) phases describe the corundum structure of hematite, while other peaks represent high purity  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>. Using Raman Spectroscopy, seven vibrational modes of hematite were observed within the first Brillouin zone: two A<sub>1g</sub> and five E<sub>g</sub> modes, confirmed from group theory. Field emission scanning electron microscopy (FE-SEM) revealed amorphous mesoporous hematite nanospheres. The grain sizes were determined by average grain intercept (AGI) averaged at 45.82 and 50.00 nm respectively. Ultraviolet-visible spectroscopy (UV-Vis) results showed good absorbance at 596.75 and 608.57 nm, with the spray pyrolysis sample yielding slightly better results. From this work it was determined that coating techniques can contribute to grain sizes, consequently contributing to improved absorption of light for photoelectrochemical (PEC) device.

Keywords: hematite, dip coating, spray pyrolysis, structural properties, optical properties, nanostructures

### Apply to be considered for a student ; award (Yes / No)?

Yes

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MSc

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