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Structural and optical properties of hematite films prepared by spin coating at varying ramping rates

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In this study, we investigated the impact of ramping rate on the structural and optical properties of hematite films prepared by spin coating. Four samples of hematite films were deposited on FTO substrate at 500°C sintering temperature and 1, 4, 8 and 12°C ramping rates respectively. XRD studies of the films revealed prominent peaks for hematite at (104) and (110) with weak reflections at (012), (113), (024), (122) and (310) planes. FE-SEM revealed spherical nanoparticles with some agglomeration into larva-shaped nanostructures. Films prepared at ramping rate of 4°C and higher showed cracks on their surfaces which increases with ramping rate. In addition, using Raman spectroscopy, increasing the ramping rate resulted in increasing red shifting of the optical phonon modes of hematite. Similar pattern of red shifting of UV-Vis absorption spectra was observed with increasing ramping rates. This was attributed to physical defects in the films which appeared in form of cracks as a result of increasing ramping rate. The films could be used as photoanodes in a PEC cell for water splitting and the level of physical defects in the films may impact on their performance.

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

Yes

Level for award (Hons, MSc, PhD, N/A)?

PhD

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