

# Microstructure and electrical properties of iron oxide thin films deposited by spray pyrolysis

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Microstructure and electrical properties of iron oxide  $\text{Fe}_2\text{O}_3$  thin films prepared by spray pyrolysis method have been experimentally characterized. The effect of substrate temperature as well as deposition time on the structural features (crystallite size and microstrain) and electric resistivity of these films has been investigated. X-ray diffraction (XRD) and scanning electron microscope (SEM) characterized the structure study. The results of X-ray diffraction showed that with increasing substrate temperature bias the film structure changed from amorphous to crystalline at the same deposition time. At a substrate temperature of  $350^\circ\text{C}$  and low deposition time,  $\alpha\text{-Fe}_2\text{O}_3$  appears almost in amorphous form. With rising the substrate temperature and deposition time, the crystallinity was improved. At  $T_{sub} > 350^\circ\text{C}$ , a well-crystallized rhombohedral phase of  $\alpha\text{-Fe}_2\text{O}_3$  was obtained. Single order Voigt profile method has been used to determine the microstructure parameters. The measured value of the crystallite size and microstrain at different substrate temperatures and different deposition times were studied. The dark resistivity measurements at room temperature showed values of  $2.122 \times 10^5$  ohm-cm for amorphous iron oxide with three orders of magnitude lower than crystalline films.

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