URN etd-0407109-183703-127
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Statistics This thesis had been viewed 63 times. Download 37 times.
Department
Year 2005
Semester 2
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title The physical properties of iron oxide thin films grown by reactive radio-frequency sputtering
Date of Defense 0000-00-00
Page Count 77

Keyword
iron oxide
hydrogen production

Abstract
Iron oxide films were grown on Si and ITO/glass substrates respectively. The effects of oxygen partial pressure, total pressure, and substrate temperatures on the film properties were investigated. The structure, surface morphology, visible light transmission, conductivity and photocurrent density of Fe2O3 films were characterized by using XRD, SEM, AFM and pontentiostat. The film thickness was measured by α-step and the growth rate was calculated by the time of deposition.
The experimental results show that the iron oxide films are all crystalline with Hematite α - Fe2O3 structure. The photocurrent density and grain sizes reach a maximum value with substrate temperature. The roughness and conductivity are related to the substrate temperature. The roughness, grain size, visible light transmittance and conductivity of films aren't obviously related to oxygen partial pressure. The photocurrent density and grain size reach a maximum value with the thickness of 200nm. The values of absorption wavelength decrease with the film thickness increase. The conductivity shows the direct proportion with film thickness. The values of absorption wavelength increase with the total pressure increase.

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etd-0407109-183703-127-001.pdf
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Date of Submission 2006-07-25