

# Optical and dielectric properties of polycrystalline gallium ferrite thin films on Pt/Si substrates

Monali Mishra (✉ [monali.mishra63@gmail.com](mailto:monali.mishra63@gmail.com))

CSIR-IMMT: Council of Scientific and Industrial Research Institute of Minerals and Materials Technology

Smrutirekha Swain

CSIR-IMMT: Council of Scientific and Industrial Research Institute of Minerals and Materials Technology

Sukalyan Dash

VSSUT: Veer Surendra Sai University of Technology

Somdutta Mukherjee

CSIR-IMMT: Council of Scientific and Industrial Research Institute of Minerals and Materials Technology

---

## Research Article

**Keywords:** GaFeO<sub>3</sub> polycrystalline thin films, Dielectric properties, Mott-Schottky analysis

**Posted Date:** December 10th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-123801/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

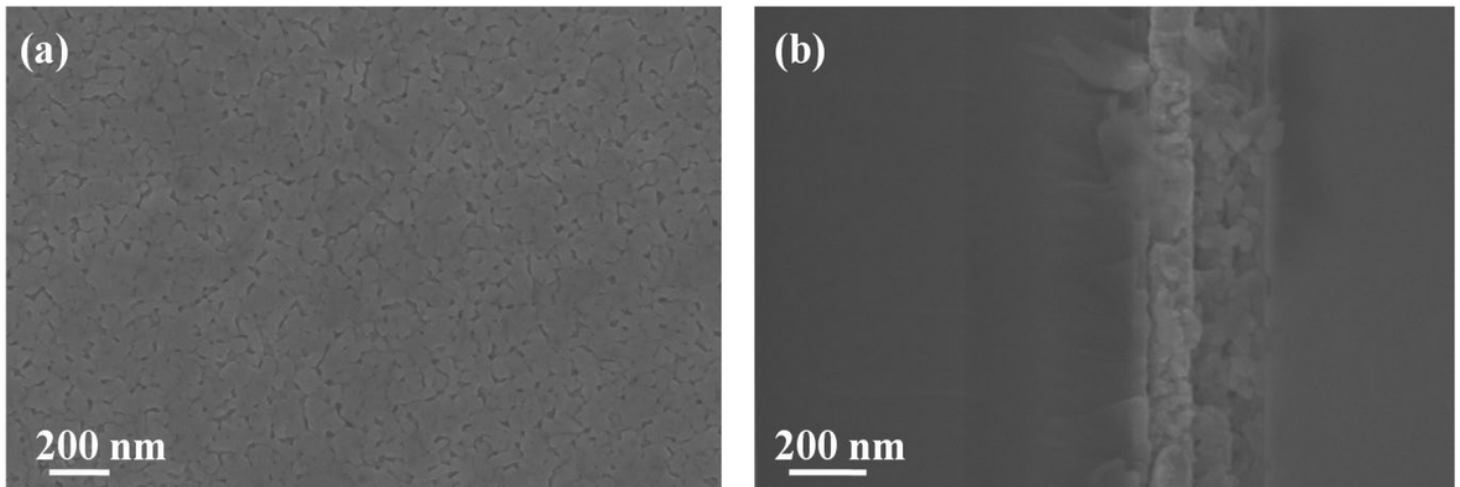
# Abstract

In this work, GaFeO<sub>3</sub> thin films are deposited on Pt/Si substrates using sol-gel spin coating technique. The effect of these films on different properties such as: structural, optical and electrical properties are investigated. X-ray diffraction (XRD) confirms that GaFeO<sub>3</sub> has orthorhombic Pn2<sub>1</sub>n symmetry. Scanning electron microscopy reveals the uniform distribution of sol and crack free nature of the films. The optical absorption spectrum was recorded using DRS UV-Vis which showed the thin films are absorbed in the visible region. We have also performed experimentally which determines the flat band potential using Mott-Schottky equation. The width of the space charge region and charge carrier concentration of the thin films is also calculated. The dielectric properties of the thin films are also studied in this paper. This work opens up the possibility for the polycrystalline GaFeO<sub>3</sub> thin films to be used as phototelectrodes.

# Full Text

This preprint is available for [download as a PDF](#).

# Figures



**Figure 1**

(a) SEM micrographs of GFO thin films deposited on Pt/Si (111) substrate and (b) thickness of the film.

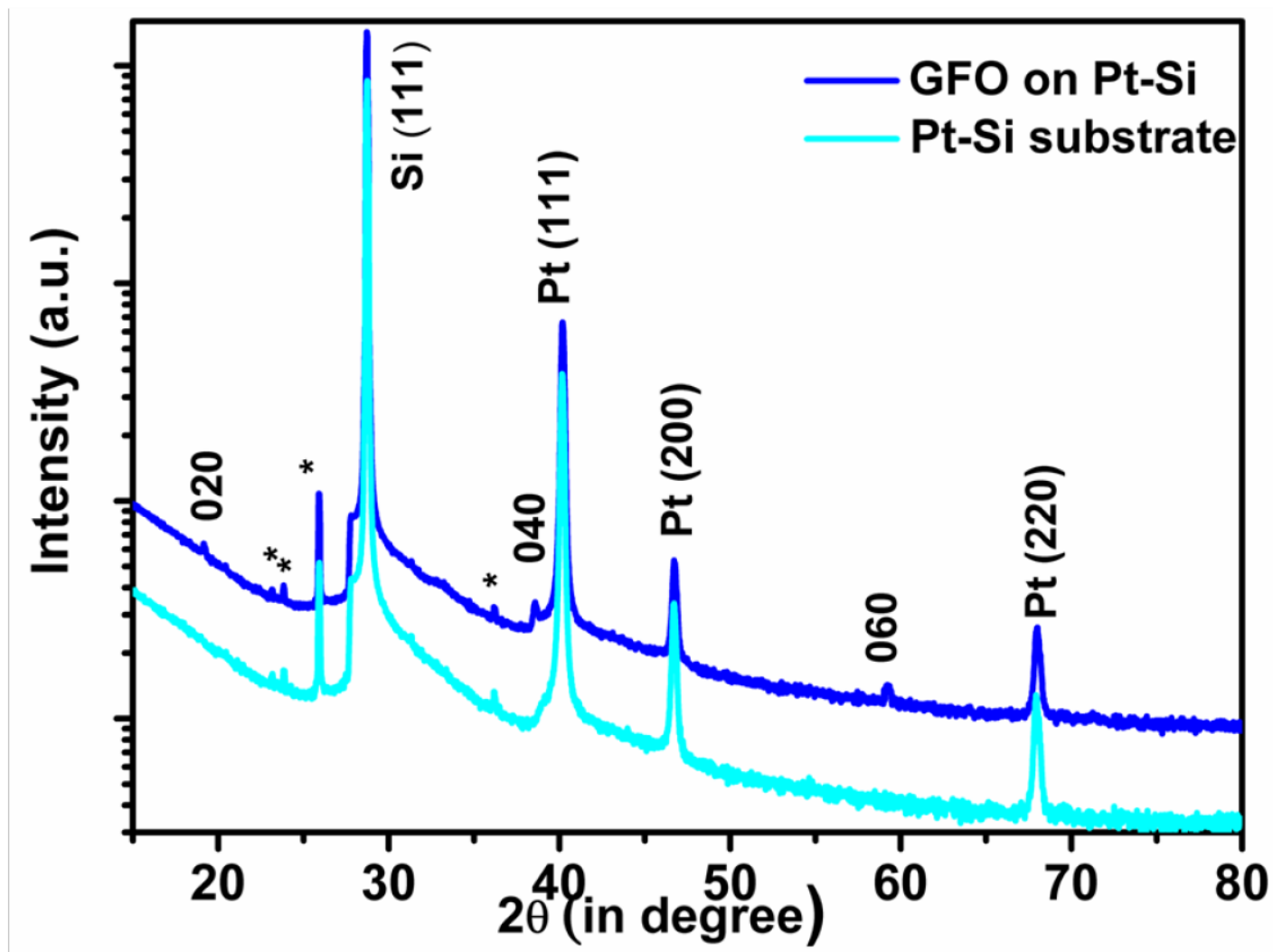
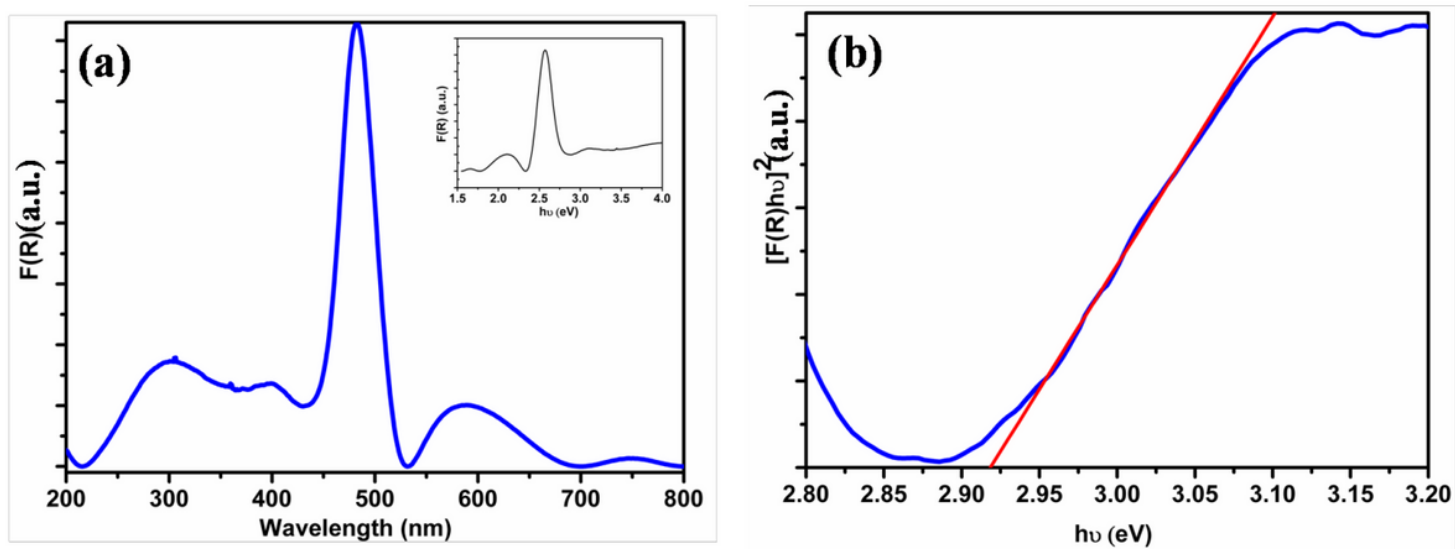


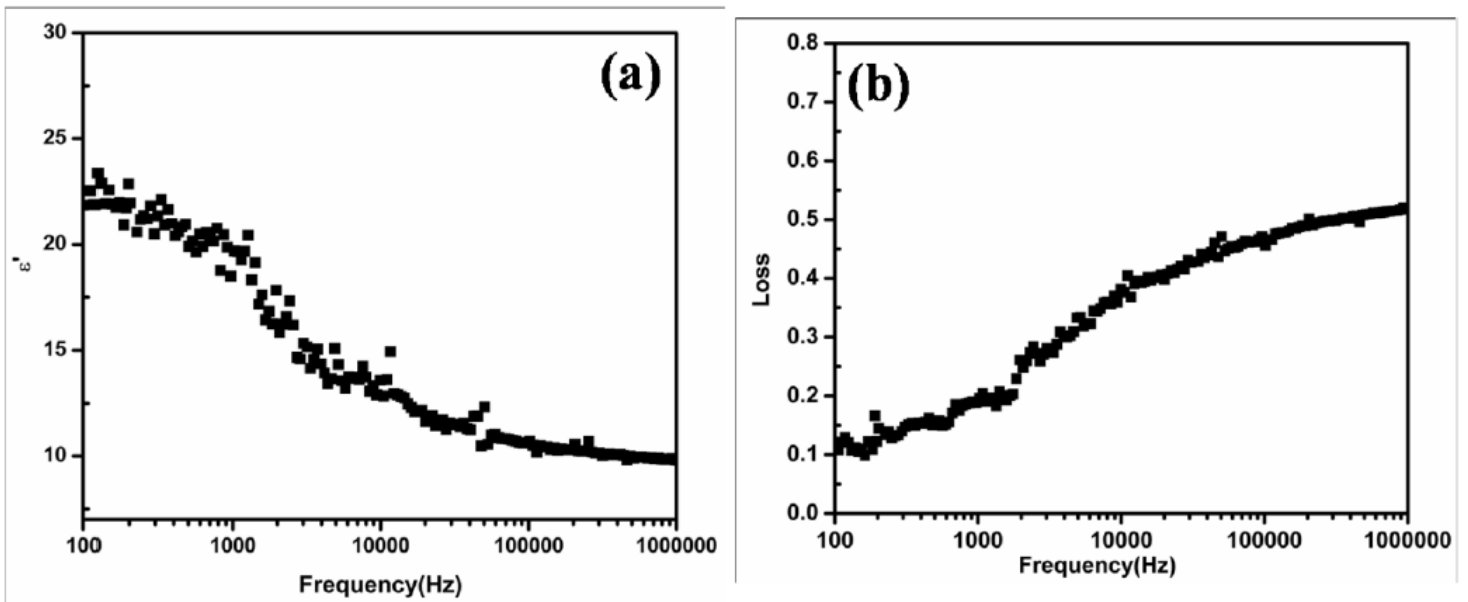
Figure 2

XRD pattern of GFO deposited on Pt-Si (111) substrate.



**Figure 3**

(a) Absorption spectra of GFO grown on Pt/Si (111) substrates, and (b) band gap of the thin film.



**Figure 4**

Frequency dependant (a) dielectric constant, and (b) dielectric loss.

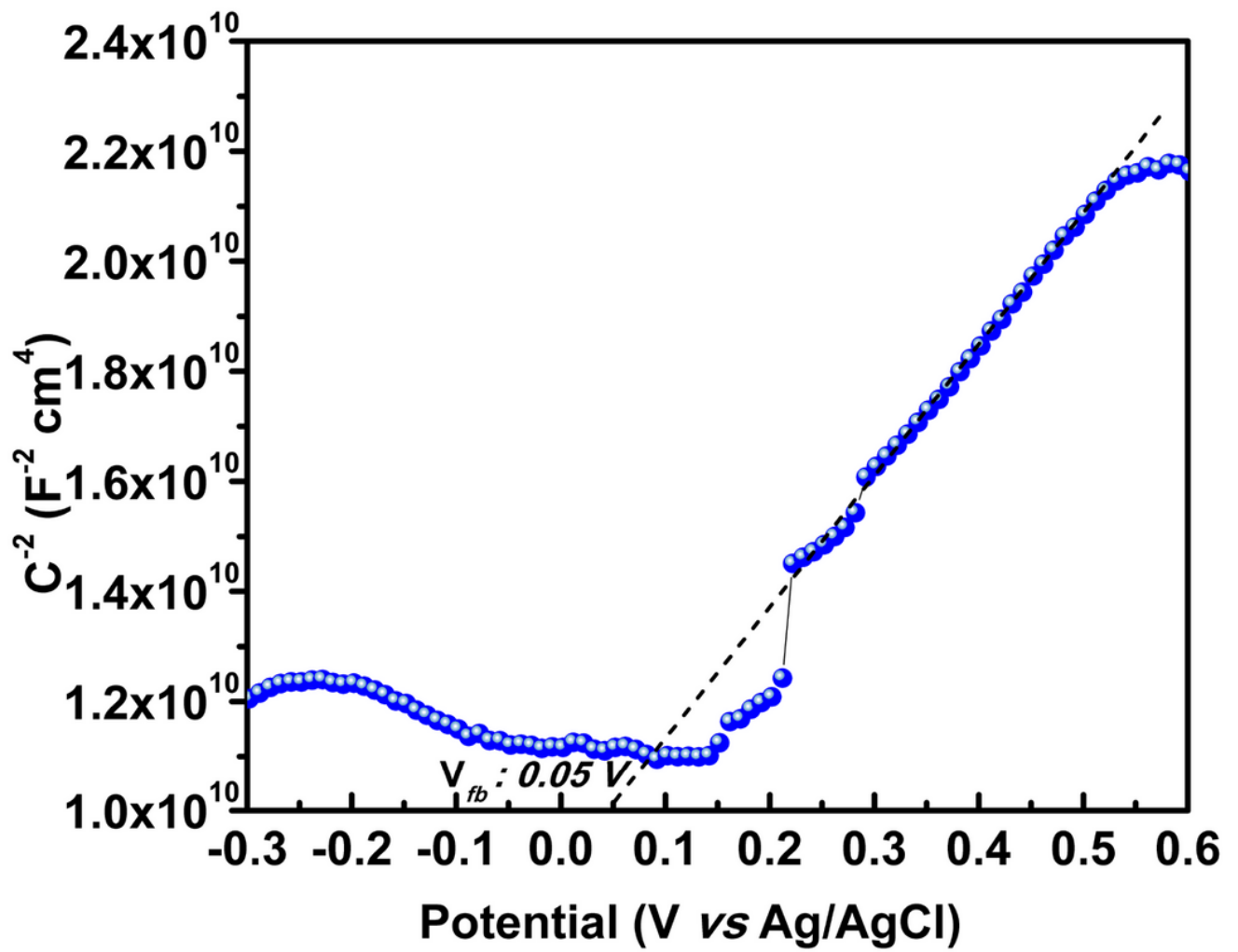


Figure 5

Mott-Schottky plot for GFO on Pt/Si substrate measured at 1 kHz.