Optical Properties of Vanadium Pentoxide Thin Films Prepared By Sol-Gel Method

By

Afaf Mustafa AL-Sheyyab

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the Department of Physics, Yarmouk University, Irbid, Jordan

Approved by:

Prof. Nehad M. Tashtoush  ___________________________ Supervisor
Professor of Physics, Yarmouk University

Prof. Mousa M. Abdul-Gader Jafar  ___________________________ Co-supervisor
Professor of Physics, University of Jordan

Dr. Bashar Ibrahim Lahlouh  ___________________________ Member
Associate Professor of Physics, University of Jordan

Dr. Mufeed Abdullah Awawdeh  ___________________________ Member
Assistant Professor of Environmental Science, Yarmouk University
Optical Properties of Vanadium Pentoxide Thin Films Prepared By
Sol-Gel Method

By
Al- Sheyyab, Afaf Mustafa
Supervisor
Prof. Nehad Mohammad Tashtoush
Co-supervisor
Prof. Mousa M. Abdul-Gader Jafar

Abstract

In this study, four samples of vanadium pentoxide thin films have been prepared by the Sol-Gel technique. The effects of preparation conditions on the film properties have been investigated. Spectrophotometric measurements were made on these films at normal incidence in the wavelength range 350 - 900 nm. The resulting data were analyzed to determine the optical constants for these films such as: the refractive index, the absorption and extinction coefficients, and the band-gap energy.

The obtained results showed that the values of the band-gap energy were reasonable, which was noted to be around 2.25±10% eV. The refractive index
and extinction coefficient of the films were calculated using two analytical approaches. The results were not close to each other; neither in values nor in behavior. In the region of the fundamental absorption edge, the absorption coefficient was calculated directly from the experimental transmittance and reflectance data using a formula that is nearly valid for non-uniform and inhomogeneous films.