

Elnaz Ebrahimi

Master student

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Scientific Background:

2018-present: **Master of Chemistry**

Department of Chemistry, Bilkent University, Ankara, Turkey

2014-2016: **Master of Materials Engineering**

Department of materials science and engineering, Faculty of Chemical & Metallurgical Engineering, University of Tabriz, Tabriz, Iran

Thesis: The effect of different additives on structural and optical properties of Borosilicate glasses.

Supervisor: Prof. Dr. Mohammad Rezvani

2008-2013: **Bachelor of Materials Engineering**

Department of materials science and engineering, University of Tabriz, Tabriz, Iran

Thesis: The effect of different additives on the kinetic parameters of P_2O_5 -CaO-TiO₂

Supervisor: Associated Professor Prof. Dr. Mohammad Rezvani

Academic Publications:

- 1) **Ebrahimi, E., and M. Rezvani.** "Optical and structural investigation on sodium borosilicate glasses doped with Cr₂O₃." Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 190 (2018): 534-538.

Research Experience:

Over the last few decades, 3d-Transition metal (TM) ion-doped glasses point out interesting spectroscopic and electrical properties because of the potency of the ions to exist in more than one valence states enabling electrical conduction to occur by the movement of carriers from lower to higher valence state. Among oxide glasses, Borosilicate glasses have the advantages of the stability of silicate glass and the higher TM ion solubility of borate glass without producing heavy concentration quenching together that make them good candidates for TM ion hosts.

- **The Ternary System SiO₂ – B₂O₃ – Na₂O**

In this work, different combination of SiO₂- B₂O₃- Na₂O glasses were prepared by melting-quenching method. The physical, Structural and Optical properties of these glasses were studied. The right combination was chosen for next studies based on the results we have approached by FTIR spectroscopy and UV-Vis transition spectra.

- **Cr₂O₃ doped Sodium Borosilicate glasses:**

In this work, Sodium borosilicate glasses with chemical composition of 60% SiO₂- 20% B₂O₃- 20%Na₂O doped with different contents of Cr₂O₃ were prepared by melting-quenching method. Physical, structural and optical properties of glasses were investigated by studying density and molar volume, Fourier Transform Infrared (FT-IR) Spectra and UV-visible absorption spectroscopy. The results showed an increase in density of glasses with the increase of Cr₂O₃ that can be due to addition of oxide with high molar mass. The optical absorption spectra of undoped glass reveals UV absorption due to trace iron impurities with no visible band however Cr₂O₃ doped glasses shows absorption in visible range that are characteristic. Increasing of Cr³⁺ ions in the glassy microstructure of samples provides a semiconducting character to Sodium borosilicate glass by reducing the direct and indirect optical band gaps of glass samples from 3.79 to 2.59 (ev) and 3.36 to 2.09 (eV), respectively. These changes could be attributed to the role of Cr³⁺ ions as the network former which asserts improvement of semiconducting behavior in presence of Cr₂O₃.

- **CuO doped Sodium Borosilicate glasses:**

The effect of different amount of CuO dopant on Sodium Borosilicate glasses has been studied in this work. Glasses having 60 SiO₂- 20 B₂O₃- 20 Na₂O (wt%) composition accompanied with CuO dopant Were prepared by melting- quenching method. In order to calculate the absorption coefficient of samples, transmittance spectra of polished glasses were measured in room temperature. Optical properties such as Fermi energy level, direct and indirect optical band gaps and Urbach energy were calculated using functionality of extinction coefficient from Fermi-Dirac distribution function, Tauc's plot and the exponential part of absorption coefficient diagram, respectively. It has been clarified that variation in mentioned optical parameters is associated with the changes in physical properties of samples like density or molar mass. On the other hand, increasing of Cu²⁺ ions up to 1.5% in the glassy microstructure of samples provides a semiconducting character to samples by reducing the direct and indirect optical band gaps of glass samples from 3.09 to 2.61 and 2.90 to 1.73 (eV), respectively. By increasing the amount of dopant more than 1.5% these properties

were increased. These changes could be attributed to the role of CuO ions as both the network former and network modifier.

- **Fe₂O₃ doped Sodium Borosilicate glasses**

We also studied on ternary Sodium Borosilicate glasses doped with different amount of Fe₂O₃. The researches revealed that Fe₂O₃ played a modifier role and caused to decrease structural order and increased the Urbach energy from 0.37 to 0.59 ev.

Academic work Experience:

- Research assistant at Advanced Ceramic lab., Department of Materials Science and Engineering, University of Tabriz.
 - Research assistant at Ozensoy lab., Department of Chemistry, Bilkent University.
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