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## Thermal Diffusivity Measurement of Germanate-Based Glass-Ceramic System Using Photoacoustic Strategy

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### Biography

Dr Bahari is a glass scientist, photonic materials researcher, tech/innovation mentor. He is the founder of a private innovation center. He has taken positions such as invited researcher at Bilkent UNAM, Marie Curie ER Leeds Uni., Guest Assist. Prof. Sharif Uni. & 3 PD positions.

### Abstract

In the present study, transparent glass ceramic (TGC) synthesized from GeO<sub>2</sub>-PbO base glass with Er/Ag doping using a controlled annealing process at different annealing times of 0, 12, 24, and 40 hours at a heating temperature of 450°C was studied. Primarily, ultrasonic sound velocity and elastic moduli of the GeO<sub>2</sub>-PbO binary glass (melt-quenching) measured by ultrasonic pulsed echo technique were reported. The crystallization behavior of the materials during the heat treatment process was studied using XRD measurement and the generation of the Ge<sub>2</sub>Pb<sub>3</sub>O<sub>7</sub> phase which is known as ferroelectric material was confirmed. Optical transparency evaluation of the material during annealing was investigated by UV-Visible absorption spectroscopy and material opaqueness was observed in the longer time of heat treatment process. A photoacoustic (PA) set-up was designed to measure the thermal diffusivity (TD) of the samples using a 632.8 nm He-Ne laser beam followed by an optical chopper and amplifier system, as well as a photoacoustic chamber equipped with a microphone device. High thermal diffusivity values were observed in the samples starting with 1.04 mm<sup>2</sup>/s for mother GeO<sub>2</sub>-PbO glass and growing to 1.82 mm<sup>2</sup>/s by increasing annealing time to 40 hours, which can be described by the development of more crystalline phase in the glass matrix. This functional material is recommended to be used for thermal management and sensing applications.

