

# High-Pressure Spectroscopic Measurements in the Condensed Matter Spectroscopy Division, University of Gdańsk

Tadeusz Leśniewski<sup>#</sup>, Agata Lazarowska<sup>#</sup>, Maciej Grzegorzczak, Natalia Majewska, Mikołaj Kamiński, Sebastian Mahlik

Condensed Matter Spectroscopy Division, Institute of Experimental Physics, Faculty of Mathematics, Physics, and Informatics, University of Gdańsk, 80-308 Gdańsk, Poland

High pressure is a powerful thermodynamic parameter that enables continuous tuning of interatomic distances and electronic interactions in condensed matter systems. Combined with optical spectroscopy, it provides valuable insight into the relationships between crystal structure, electronic states, and luminescent properties of materials.

This poster presents the high-pressure spectroscopic capabilities available in the Condensed Matter Spectroscopy Division at the University of Gdańsk. Measurements are performed using diamond anvil cells, allowing pressures of up to 40 GPa to be generated. The experimental infrastructure enables photoluminescence, photoluminescence excitation, Raman, and time-resolved emission spectroscopy studies under high pressure over a broad spectral range extending from the ultraviolet and visible to the near-infrared region. In addition to high-pressure experiments, the available infrastructure enables spectroscopic measurements over a wide temperature range (10–400 K), allowing combined pressure- and temperature-dependent investigations.

The presented facilities are applied to investigations of a wide variety of functional materials, including transition-metal- and rare-earth-doped phosphors for visible and infrared photonics. High-pressure spectroscopy is used to study crystal-field interactions, electron–phonon coupling, phase transitions, energy transfer mechanisms, and non-radiative relaxation pathways. Selected examples demonstrating the potential of pressure as a tool for tailoring and understanding the optical properties of condensed matter systems will be discussed.

The poster aims to provide an overview of the available instrumentation and to highlight opportunities for collaborative research involving high-pressure optical spectroscopy.

# tadeusz.lesniewski@ug.edu.pl, agata.lazarowska@ug.edu.pl