Contribution ID: **113** Contribution code: **S06-CMPSP-104** Type: **Oral presentation**

Raman Spectroscopy Study of magnetic Quasi-two-dimensional materials

Quasi-two-dimensional materials, known for their easy exfoliation to a monolayer and unique optical and transport properties are promising candidates for nanospinctronics and nanoelectronics. Experimental confirmation of magnetic ordering persisting to a monolayer in these complex systems in 2017 did not only widen up the area of their potential application, but also opened up a completely new experimental field in condensed matter physics. Considering that previously widely accepted theories forbid magnetic ordering in 2D systems, it is no surprise that magnetic quasi-2D materials have only recently become an area of extensive study. Aiming to provide much needed insight into these systems, we have performed Raman spectroscopy studies of CrI3 and VI3 single crystals. Polarization dependent Raman spectra of CrI3 single crystals were analyzed in accordance with suggested low-temperature and high-temperature structures, confirming the existence of phase transition between the low-temperature rhombohedral and the high-temperature monoclinic structure [1]. In the temperature dependence of phonon energies and line widths a clear splitting of the Eg rhombohedral modes into the Ag and Bg monoclinic modes can be observed at 180 K, contrary to the previously reported 220 K. No phase co-existence can be tracked within our spectra. Polarization dependent Raman spectra, together with DFT calculations and PDF analysis of synchrotron XRD patterns, provided an answer to the on-going debate regarding the crystal structure of VI3 [2]. Our results point to two possible scenarios: the coexistence of two phases, short range ordered $P\bar{3}1c$ and long range ordered $R\bar{3}$ as two segregated phases and/or randomly distributed short range ordered $P\bar{3}1c$ domains in the long-range ordered $R\bar{3}$ lattice. Observed phonon line asymmetry of the most pronounced peak indicates strong spin-phonon coupling in this quasi-two-dimensional material.

References

1. S. Djurdjić Mijin, A. Šolajić, J. Pešić, M. Šćepanović, Y. Liu, A. Baum, C. Petrovic, N. Lazarević, and Z. V. Popović, Lattice dynamics and phase transition in CrI3 single crystals, Phys. Rev. B 98, 104307 (2018)
2. S. Djurdjić Mijin, A.M. Milinda Abeykoon, A. Šolajić, A. Milosavljević, J. Pešić, Yu Liu, C. Petrovic, Z. V. Popović, N. Lazarević, Short-range order in VI3, Inorg Chem. 59 (22):16265-16271 (2020)

Primary authors: Dr DJURDJIĆ MIJIN, Sanja (Institute of Physics Belgrade, University of Belgrade, Serbia); Ms ŠOLAJIĆ, Andrijana (Institute of Physics Belgrade, University of Belgrade, Serbia); Dr ABEYKOON, A.M. Milinda (National Synchrotron Light Source II, Brookhaven National Laboratory, Upton, USA); Dr MILOSAVLJEVIĆ, Ana (Institute of Physics Belgrade, University of Belgrade, Serbia); Dr ŠĆEPANOVIĆ, Maja (Institute of Physics, University of Belgrade); Dr LIU, Yu (Department of Condensed Matter Physics and Materials Science, Brookhaven National Laboratory); Dr PEŠIĆ , Jelena (Institute of Physics Belgrade, University of Belgrade, Serbia); Dr PETROVIC, Cedomir (Department of Condensed Matter Physics and Materials Science, Brookhaven National Laboratory); Prof. POPOVIĆ, Zoran V. (Institute of Physics Belgrade, University of Belgrade, Serbia & Serbian Academy of Sciences and Arts, Belgrade, Serbia); Dr LAZAREVIĆ, Nenad (Institute of Physics Belgrade, University of Belgrade)

Presenter: Dr DJURDJIĆ MIJIN, Sanja (Institute of Physics Belgrade, University of Belgrade, Serbia)

Session Classification: S06 Condensed Matter Physics and Statistical Physics

Track Classification: Scientific Sections: S06 Condensed Matter Physics and Statistical Physics