

Hosting University:

Dr. Siddharth S. Saxena
Quantum Matter Group
Cavendish Laboratory
Madingley Road,
Cambridge, CB3 0HE, UK

Visiting student:

**TECHNICAL UNIVERSITY
of LIBEREC**

MSc. Iryna Tyagur
Faculty of Sciences, Humanities and
Education
Department of Physics,
Studentska 2, 461 17 Liberec 1, Czech
Republic

Scientific report

Period of the visit: March 14th – 31st, 2009

Purpose of the visit: investigations of ferroelectric semiconductor $\text{Sn}_2\text{P}_2(\text{Se}_x\text{S}_{1-x})_6$ samples with different concentration of Se in wide temperature and pressure range, discussion of the future collaboration

Description of the work carried out during the visit:

During the short term visit of Cavendish Laboratory the following issues were carried out:

- samples of $\text{Sn}_2\text{P}_2(\text{Se}_x\text{S}_{1-x})_6$ with $x = 0\%$, 28% and 100% were prepared for high pressure measurements in the pressure cell. As there is a limitation on the size, samples were cut into smaller pieces, masked with Ag paste and sputtered with Au electrodes, thereafter they were cleaned, placed on the board and connected to the measuring wires. While preparation of the samples the pressure cell was tested
- a piece of $\text{Sn}_2\text{P}_2\text{Se}_6$ crystal was sputtered with Au electrodes; dielectric low temperature measurements in cooling mode (down to 350mK) and heating mode (up to room temperature) for $\text{Sn}_2\text{P}_2\text{Se}_6$ sample were realized
- dielectric low temperature studies in cooling mode (down to 350mK) and heating mode (up to room temperature) for $\text{Sn}_2\text{P}_2(\text{Se}_{0.05}\text{S}_{0.95})_6$ sample at different frequencies 1kHz, 50kHz and 100kHz were realized
- sample of $\text{Sn}_2\text{P}_2(\text{Se}_x\text{S}_{1-x})_6$, $x = 15\%$ crystal was prepared for measurements; investigations of the polarization at different temperatures in the region of 125 – 325K were made

Description of the main results obtained:

- samples and the cell are ready for temperature investigations of the resistance at different pressures
- during the low temperature studies of $\text{Sn}_2\text{P}_2\text{Se}_6$ sample the phase transition in the low temperature region was observed
- the small dispersion of the dielectric constant at different frequencies in the low temperature region was observed for $\text{Sn}_2\text{P}_2(\text{Se}_{0.05}\text{S}_{0.95})_6$ crystal
- dependences of the polarization versus different temperatures were obtained for $\text{Sn}_2\text{P}_2(\text{Se}_{0.15}\text{S}_{0.85})_6$ sample

Future collaboration with host institution

Made investigations form a basis for long term collaboration in this field. It was suggested to apply for a half year exchange grant.

In Liberec 4th April, 2009



UNIVERSITY OF
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March 25, 2009

Certificate of Stay

Dear Madam/Sir

This is to certify that Miss Iryna Tyagur of University of Librec, Czech Republic was a visiting research student to the Cavendish Laboratory of Department of Physics, University of Cambridge, United Kingdom. She spent the period of 14th and 31st March 2009 in our laboratory.

During the visit she started a programme of measurements on specimens of $\text{Sn}_2\text{P}_2(\text{SexS1-x})_6$ at high pressures and Low Temperatures, which has now formed a basis of long term collaboration between us.

We are very happy with the quality of her work and would hope to continue to have her visit on collaborative basis in the futre

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Dr. Siddharth S. Saxena
Director of Physics and Fellow, Jesus College and Cavendish Laboratory, University of
Cambridge.