



**MANAV RACHNA  
UNIVERSITY**  
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**School of Applied Sciences, Department of Physics,  
Manav Rachna University, Faridabad**

**Report on International Collaborative Research at  
Pohang Accelerator Laboratory, South Korea, during 18<sup>th</sup> -24<sup>th</sup> December 2022**

Name of the Principal Investigator: **Dr Aditya Sharma**

Name of M.Sc (Physics, III sem.) Student conducted the experiments: **Ms. Janhavi Sharma**

**Brief Profile of the Principal Investigator:**

Dr. Aditya Sharma, Faculty In-Charge of University Instrumentation Centre (UIC-MRU) & Assistant Professor in department of Physics, has more than 10 years of experience in research/teaching of Nano-Hybrid materials based on Pelletron & Synchrotron accelerators. He worked as Research Scientist at Korea Institute of Science and Technology (KIST), Seoul, and Post-Doctoral researcher at Pohang Accelerator Laboratory (PAL), South Korea. He has published more than 60 research papers in SCI/SCOPUS journals, 05 book chapters and actively functioning as an editor/reviewer of various international journals. He also has couple of major/minor research projects funded by different funding agencies of Govt. of India. He has also received international travel grants (02 times) from foreign countries (South Korea).

**The objective of the International research collaboration:**

To enrich the students of Manav Rachna University, with the concept & design of modern machines, their utilization in the Nano-Hybrid materials for probing their functionality in the futuristic applications; such as, Gas-sensors, Solar-cells, Batteries, photo-catalyst and bio-medical. The collaborative research efforts were aimed to provide hand-on training to the research student, developing the new material using the sophisticated techniques (which are less-accessible in our country) for the futuristic technology, and to fill the gap between academia and research centers/laboratories of high standard. Importantly, the visit was aimed to plan and design the research projects for Indo-Korean joint research scheme for the year of 2023.

**Experiments conducted and the expected outcomes:**

The experiments were started by loading the previously prepared samples (by the students and P.I) in high vacuum chamber. Thin films of SrVO<sub>3</sub>, InGaZnO, ZnSnO<sub>3</sub> were deposited using the RF-magnetron sputtering technique on Si and Quartz substrates using the experimental facilities of IUAC, New Delhi. Some of the thin films were also ion-implanted (to modify their Fermi-level and adjust their orbital hybridization) with 200 keV Ag ion beams. Such samples were subjected to the X-ray interaction to probe the local electronic structure, hybridization of frontier orbitals and evaluate the local structural disorders caused by the ion-implantation. P.I of the research and the scientist of the inviting laboratory are able to justify the experimental results with the expectations made before the experiments. Several research papers in SCI/SCOPUS journals will be communicated after analysis/simulation of the experimental data. Moreover, the students get trained to operate the machines, using the vacuum techniques and production/focusing of the X-rays. This will help to the students to develop their future research career. The experiments were finalized with a vote of thanks to the Korean Scientist (Dr. Hyun-Joon Shin) who invited us (Dr. Aditya Sharma and M.Sc. student of Manav Rachna University), and helped to perform the experiments. Importantly, planning of the Indo-Korea joint research projects (for Na ion battery materials) is done for the coming year 2023. Hope to get the favorable results.

A few glimpses of the session are attached herewith.

