Thin Film and Device Lab

One of the most important methods of exploiting the potential of materials' properties to integrate them into thin-film based homo/heterostructures devices such as solar cells, chemical and biological sensors, electronic devices including next-generation molecular electronic devices, multistate memories, and even quantum devices. The Thin Film and Device Laboratory at IIT Jodhpur is aiming to develop thin-film devices for novel applications. The laboratory is focusing not only on the experimental aspects but also supporting the device physics with the fundamental studies. The department is equipped with various thin film fabrication instruments including in-house developed low-cost solution processing techniques such as spin coater, dip coater, and hydrothermal cells together with more advanced and sophisticated DC and RF magnetron sputtering system for single and multilayer thin film depositions, and thermal chemical vapor deposition system to fabricate thin-film nanostructures in different geometries. The thin-film laboratory is using simple, low cost, and easily scalable technologies for solar PV and thermal technologies together with chemical and biological sensors, flexible organic devices for memory, and other applications. The synthesis laboratory provides the opportunity to develop materials ranging from bulk thin films to 2D and 1D nanostructured thin-film structures on various substrates for different applications such as energy, water, health, and environment.

The laboratory is well furnished with state-of-the-art sensor and memory device characterization equipment and focusing on functional materials based thin-film heterostructures for potential next-generation devices. It includes electronic devices such as memory, information, and neuromorphic computing devices, energy devices such as quantum dot sensitized (QDSSCs) and heterostructure based single and tandem junction solar photovoltaic devices, nanostructured thermoelectric devices, and optical devices such as

artificial photonic/metamaterials thin-film heterostructures with unusual physical/chemical properties, not observed in common materials.

Thus, the main objective of the thin film and device laboratory is to innovate and develop novel thin-film heterostructures with new materials' properties for next-generation electronic devices, including quantum computation using ultrathin superconducting thin film heterostructures and magnetoelectric thin film heterostructures for ultrahigh density data storage and processing. The laboratory is continuously upgraded with the state-of-the-art materials synthesis, device fabrication, and their characterization equipment to meet with current needs and compete with future technologies.