Bringing the excitement of semiconductor materials to the classroom

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In the 21st century, semiconductors underpin nearly every technology in our daily lives, from smartphones and solar cells to sensors and communication systems. Yet, in most Indian high-school/ undergraduate educational settings, semiconductor physics remains confined to theoretical classroom discussions, with students and teachers in most schools and colleges rarely having opportunities to explore semiconductor concepts through hands-on experimentation. This gap is particularly significant in resource-limited institutions where access to tools such as vacuum deposition systems for device fabrication or even oscilloscopes are unavailable. Many students and teachers have perhaps never seen a piece of silicon or realize the cause of the bluish tinge of commonly deployed solar panels.

We have been developing a range of low-cost hands-on experiments that make semiconductor studies tangible and affordable. I will share some examples of our work, including making a low-cost Hall effect setup for investigating charge carriers, testing an organic electronics kit (boxperiment.de) that allows LEDs and solar cells to be fabricated in any classroom, and experiments exploring the smartphone's ambient light sensor. Such activities make semiconductor physics both accessible and exciting. This presentation will share our experience in designing, developing, testing, and taking these experiments to diverse learning environments across India.