GI-MS48-P13 | OPTICAL SIMULATION OF CRYSTAL DIFFRACTION USING MODIFIED VIDEO PROJECTORS - A TEACHING PROPOSAL

Lehmann, Jannis (ETH Zurich, Zürich, CH); Tzschaschel, Christian (ETH Zurich, Zürich, CH); Fiebig, Manfred (ETH Zurich, Zürich, CH); Weber, Thomas (ETH Zurich, Zürich, CH)

In this presentation, we will demonstrate an advanced method for teaching the principles of diffraction in the classroom. Using low-cost microdisplays extracted from commercial video projectors, we generate, in real time, optical diffraction patterns of any structure that can be displayed on a computer screen. By upscaling to the optical regime, this interactive framework provides hands-on experience of scattering phenomena that can go beyond simplest-case examples. Hence, it can be applied to perform diffraction studies from incommensurate structures or other systems with great complexity. Furthermore, an evolution of diffraction patterns from dynamic processes such as structural changes or phase transitions can be demonstrated. As a result, students will get a realistic impression of fundamental concepts of diffraction such as reciprocal space, structure factors, selection rules, symmetry and symmetry violation as well as diffuse and sattelite scattering. In comparison to traditional experimental (illuminating slides of ink patterns) or computational (calculating the fourier transform) teaching approaches, our method has the advantage of being interactive and intuitive. In particular, the physical equivalence of the diffraction process as well as the flexible and immediate control over displayed structures overcomes static limitations of printed ink patterns and avoids numerical artefacts of calculated transforms. Our novel approach has proven very helpful in teaching crystal diffraction to undergraduate students in materials science.