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Meeting report

New Features in Landyne 5 - A Software Suite for Materials Characterization and Crystallography by Transmission Electron Microscopy

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Landyne software suite (version 5) includes fifteen stand-alone computer programs for materials characterization and crystallography by transmission electron microscopy [1]. A launcher interface is provided for users to access all components conveniently. The purpose of this software suite is twofold: i) as research tools to analyze experimental results, ii) as teaching tools to explore the varieties of electron diffraction methods and crystallographic image processing principles.

The Landyne suite previously included: PTable, an interactive periodic table of elements; SVAT, a structural visual and analytical tool; SAED and PCED, simulation and analysis of electron diffraction (spot

Published in *Microscopy and Microanalysis*, 29 (Suppl 1), 2023, 737–738

doi:10.1093/micmic/ozad067.363

Published by Oxford Academic for Microscopy Society of America.

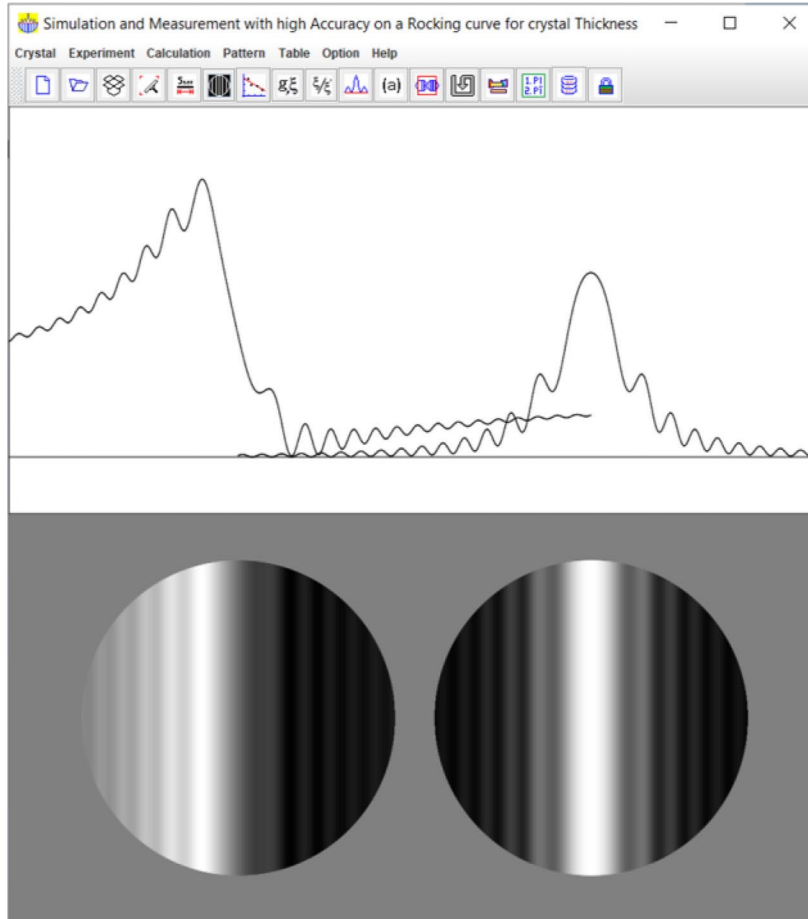


Fig. 1. The GUI of SMART. The rocking curve and CBED pattern of Aluminum under the condition of two-beam with a diffraction disk of $g(200)$.

and ring) patterns; QSAED and QPCED, the processing and quantification of electron diffraction (spot and ring) patterns; HOLZ, simulation and analysis of higher-order Laue zone patterns; TEMUC, determination of crystal unit-cell using experimental electron diffraction results with a double-tilt holder in TEM; SPICA, a stereographic projection for interactive crystallographic analysis.

Besides briefly describing the updated features of the above components, we will mainly introduce the new components in the Landyne suite (version 5). SAKI [2] is for simulation and analysis of Kikuchi diffraction patterns, with application to precise determination of crystal orientation. SMART is for simulation and measurement with high accuracy of a rocking curve for crystal thickness. It can simulate two-beam

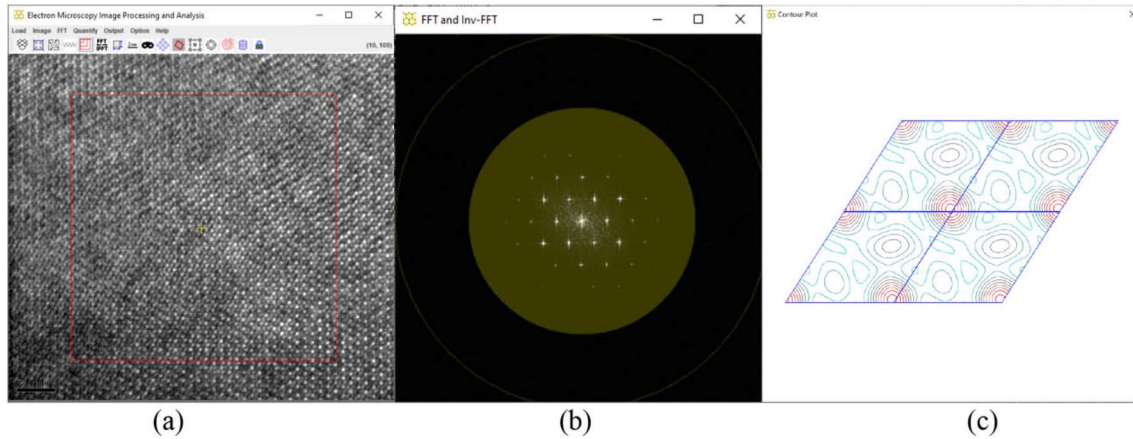


Fig. 2. (a) The GUI of HREM-GIP/CIP with an HREM image as an example. (b) The FFT pattern, and (c) a contour map of the HREM image.

convergent-beam electron diffraction (CBED) patterns, including the absorption effect, and as a tool assisting the measurement of crystal thickness using an experimental two-beam CBED pattern. Figure 1 shows the graphic user interface (GUI) of SMART and the rocking curve and CBED pattern of Aluminum under two-beam conditions. CTFscope [3] is a simulation and visualization of the contrast transfer function (CTF) for conventional and aberration-corrected TEM. The CTF expresses to what extent the amplitudes converted from the phase changes of the diffracted waves contribute to the TEM image, including the effects of lens aberrations. ESPOT is for generating electrostatic potential (ESP) maps from electron diffraction patterns. It can be used to calculate the ESP projection and to fit structural models with experimental electron diffraction patterns. HREM-GIP is for general image processing of high-resolution electron microscopy (HREM) images, and HREM-CIP is for crystallography image processing of HREM images. The CIP method is a well-developed process for determining the atomic structure of crystalline matter from HREM images. The approach was first applied to periodic organic complexes, subsequently to inorganic crystals, and then to scanning probe microscope (SPM) images of two-dimensional periodic arrays. Figure 2 shows (a) the GUI of HREM-GIP/CIP with an HREM image as an example, (b) the panel for FFT and inverse FFT, and (c) the contour map of the HREM image in (a).

The Landyne suite was coded in Java. A Java virtual machine, i.e., J2RE, must be installed to run the suite. Java Advance Image, `jai_codec.jar`, and `jai_core.jar` should copy to, e.g., `java\jre\lib\ext\` folder. The executable bytecodes, together with user manuals and the structural data files for testing, are available on the Landyne website [1].

References

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