Present Status of Electron Crystallography on Inorganic Materials

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The most promising alternative to X-rays for structural analysis of extremely small volumes are fast electrons, whose interaction with matter is several orders in magnitude stronger than of X-rays. Thus the two main branches of electron crystallography, electron diffraction structure analysis (EDSA) and (crystallographic) image processing of high-resolution electron microscopy images, are the methods of choice for structural characterisation of small samples and nanocrystalline materials.

Over the last years we have been witness of several new upcoming techniques on instrumentation that have pushed the frontiers of electron crystallography much further. The electron precession beam technique for example, considerably increases the obtainable resolution of any spot electron diffraction pattern and significantly reduces the dynamical contribution to the intensities of zone axis patterns. Thus this method is becoming a very attractive tool for scientists who want to determine crystal structures by EDSA. Another recent breakthrough took place in the field of high-resolution electron microscopy. A new generation of C_s-corrected FEG-TEM's and newly developed software enable to reconstruct the exit wave of crystals with resolution in the sub-Å range from through focus series.

These recent developments are now going to turn electron crystallography – more than 65 years after it's invention by Russian scientists – into a reliable and handy method for structure determination of tiny crystallites and nanosized materials.

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