

Accurate and precise lattice parameters by selected-area electron diffraction in the transmission electron microscope

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ABSTRACT

Lattice parameters for gold nanocrystals, quartz, and vesuvianite have been determined by electron diffraction in routine transmission electron microscopy (TEM) work, with precision and accuracy near to 0.1%, after correction for elliptical distortion. The distortion, measured in three different microscopes, is constant for each microscope and may be easily eliminated.

Variable camera constants have been avoided by positioning the oriented specimen on the eucentric plane and using parallel illumination. The current flowing in the first intermediate lens was kept fixed, assuring constant conditions of the TEM projecting system, with no further diffraction focus applied.

Application of this method to micas from metamorphic rocks produced deviations between measured and expected values up to 0.8%. Although easy species distinction is still possible, minor crystal chemical differences within the sample may be lost. Likely causes of these deviations are the possible heterogeneous samples, as well as beam damage leading to cation loss with subsequent variation in basal spacings.

Keywords: Electron diffraction, lattice parameters, elliptical distortion, mica