

Geometrical Phase Analysis

Lattice Deformation and Strain Analysis

GPA generates fully quantitative deformation and strain maps from HR(S)TEM images.

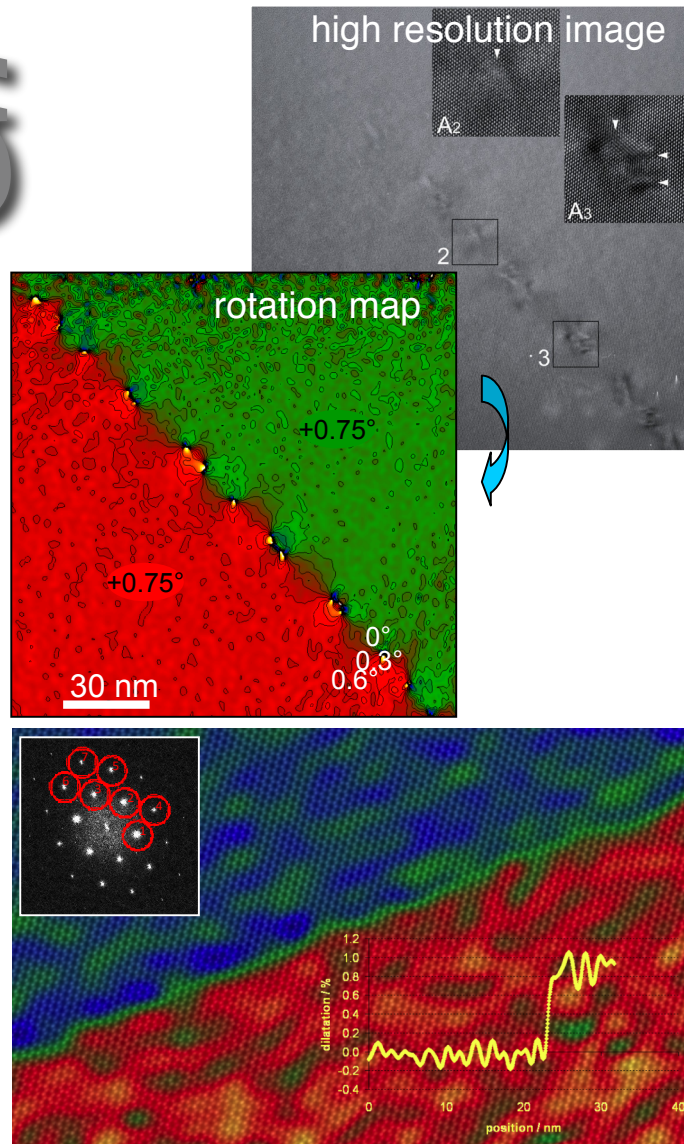
GPA is based on geometric phase algorithms originally developed by Martin Hÿtch [1].

Key Features

- ◆ Determines geometric phase images using choice of masks and real-space averaging [1]
- ◆ Generates 2D deformation tensor from HR(S)TEM images (see left for local rotation map from HRTEM image [2])
- ◆ Allows calculation of color maps and contours of strains (see above right for stresses around an edge dislocation [3])
- ◆ Corrects for optical distortions due to the projector lens system of the electron microscope [4]
- ◆ Generates strain tensors from multi-spots analysis (see bottom for lattice expansion map obtained from seven spots)

References:

- [1] M.J. Hÿtch, E. Snoeck and R. Kilaas, *Ultramicroscopy* 74 (1998) 131–146. Quantitative measurement of displacement and strain fields from HREM micrographs
- [2] C. L. Johnson, M. J. Hÿtch, P. R. Buseck, *PNAS* 101 (2004) 17936-17939. Nanoscale waviness of low-angle grain boundaries
- [3] M. J. Hÿtch, J-L. Putaux, J-M. Pénisson, *Nature* 423 (2003) 270-273. Measurement of the displacement field around dislocations to 0.03Å by electron microscopy
- [4] F. Hÿe et al. *J. Electron Microscopy* 54 (2005) 181-190. Calibration of projector lens distortions



lattice expansion map from multi-spots

