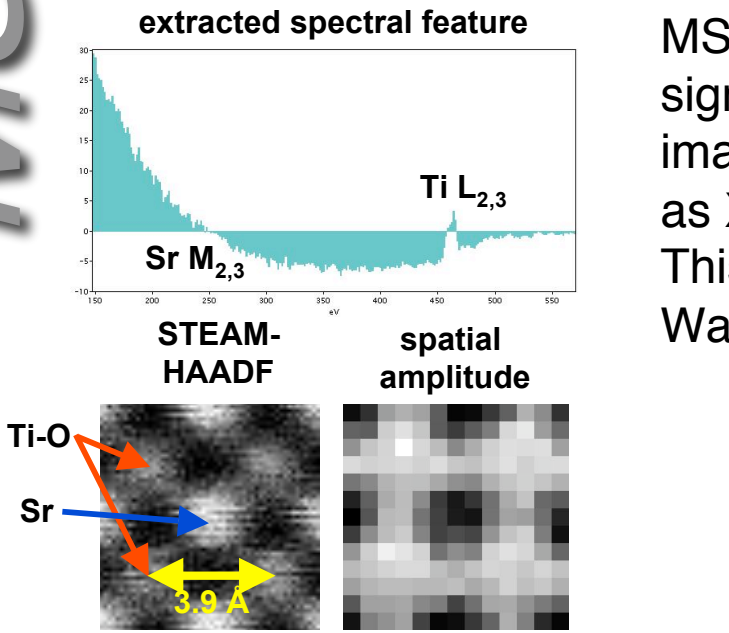
MSA

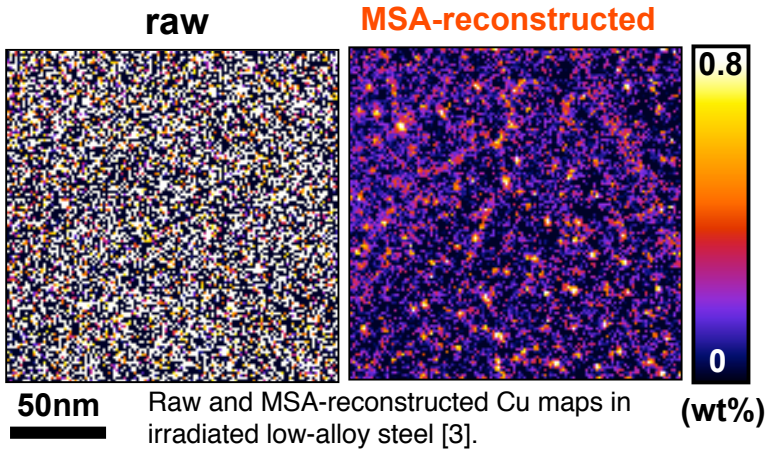
DigitalMicrograph Plug-in

Multivariate Statistical Analysis

Advanced Manipulation Tools for Spectrum Images (SIs)



Ti $L_{2,3}$ signal extracted from atomic-column STEM-EELS SI of $SrTiO_3$ [2].



Raw and MSA-reconstructed Cu maps in irradiated low-alloy steel [3].

MSA for Gatan DigitalMicrograph finds statistically significant features from 2D and 3D spectrum images gathered by spectrometric techniques such as XEDS, EELS, EFTEM and cathodoluminescence. This plug-in was originally developed by Masashi Watanabe [1].

Key Features

- ◆ Automatically extracts statistically significant spectral features and corresponding spatial amplitudes as principal components (see left top figure)
- ◆ Performs efficient noise reduction on SIs
- ◆ Enhances weak signals hidden under noise in SIs (see left bottom figure)
- ◆ Includes utilities to import line profiles and SIs obtained by other acquisition systems than Gatan DigitalMicrograph.

References:

[1] M. Watanabe, D.B. Williams and M.G. Burke, Atomic-Level Analytical Electron Microscopy of Diffusional Phase, in Proc. Inter. Conf. on Solid-Solid Phase Transformations in Inorganic Materials 2005 - Vol. 2, pp. 431-442 (2005)

[2] M. Watanabe, M. Kanno, D.W. Ackland, C.J. Kiely and D.B. Williams, Applications of Electron Energy-Loss Spectrometry and Energy Filtering in an Aberration-Corrected JEM-2200FS STEM/TEM, *Microscopy and Microanalysis*, **13** (2007), Suppl. 2, 1264-1265

[3] M.G. Burke, M. Watanabe, D.B. Williams and J.M. Hyde, Quantitative characterization of nanoprecipitates in irradiated low alloy steels: advances in the application of FEG-STEM quantitative analysis to real materials, *J. Mater. Sci.* 41(2006), 4512-4522