Highlights

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An automatic method for atom identification in scanning tunnelling microscopy images of Fe-chalcogenide superconductors

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We describe a computational approach for the automatic recognition and classification of atomic species in scanning tunnelling microscopy images. The approach is based on a pipeline of image processing methods in which the classification step is performed by means of a Fuzzy Clustering algorithm. As a representative example, we use the computational tool to characterize the nanoscale phase separation in thin films of the Fe-chalcogenide superconductor $FeSe_xTe_{1-x}$, starting from synthetic data sets and experimental topographies. We quantify the stoichiometry fluctuations on length scales from tens to a few nanometres.

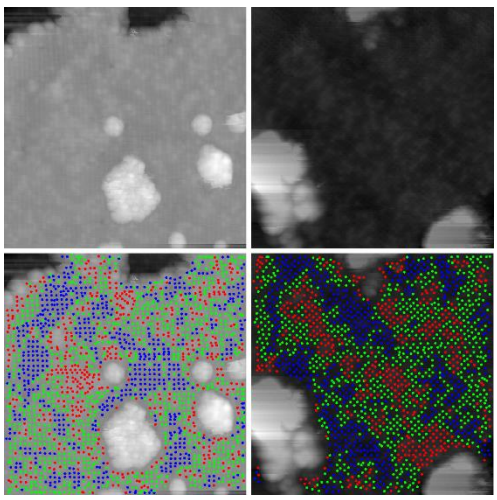

Figure 1. Original images (top line) and the corresponding atomic classifications (bottom line). In the images showing the classification results, red dots represent Fe, green dots represent Te and blue dots represent Se.

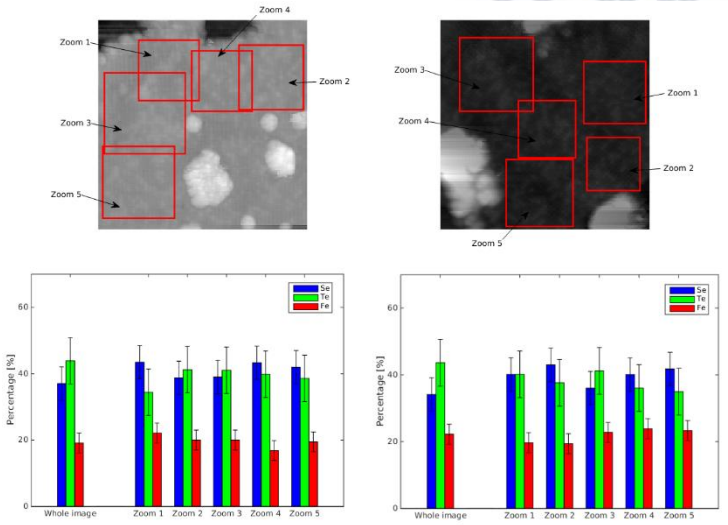

Figure 2. Zoomed regions of the original images (top line) and the corresponding population ratios (bottom line).