# 3D characterization of nanomaterials from 2D STEM images acquired along a single viewing direction

The 3D characterization of nanomaterials has great importance since there is a direct relationship between the properties and the structure. Electron tomography is one of the most known and powerful methods to retrieve the 3D atomic structure. However, it has several limitations when studying beam sensitive materials and dynamic processes since the conventional electron tomography requires multiple exposures along with different viewing directions. Therefore, to overcome the limitations of the conventional electron tomography, atom counting using statistical parameter estimation theory has been combined with molecular dynamics relaxation studies. Nevertheless, it is not always straightforward to apply this technique since the relaxation procedure may easily end up in a local energy minimum, instead of the global energy minimum, which makes it sensitive to the interatomic potentials and initial atomic positions. In this study, we present a robust methodology to investigate the 3D structure evolution of the nanoparticles as a function of temperature by using 2D STEM images acquired along a single viewing direction.