

The Advancement of In-Situ TEM Research and Technologies

In-situ TEM, the application of transmission electron microscope as a tool to study dynamic changes of a specimen has progressed rapidly over the last decade. Recently, with the advancements in micro electro mechanical systems (MEMS) based technologies, the local environment of TEM specimen, e.g. thermal, electrical, magnetic and even chemical environment, can be accurately controlled such that the resulting structure changes of specimen can be imaged down to sub-Angstrom resolution. This opens the possibility of understanding kinetics of materials at atomic level.

Here we would like to show two examples. One is in situ TEM observation of a sintering process of nanoparticle at elevated temperature, in which the dynamic self-assembly process of nanoparticles through oriented attachment is recorded and understood at atomic level. The other is observation of the precipitation growth in Al matrix during thermal annealing, in which precipitate hardening process can be well interpreted according to recorded atomic structure evolution.