

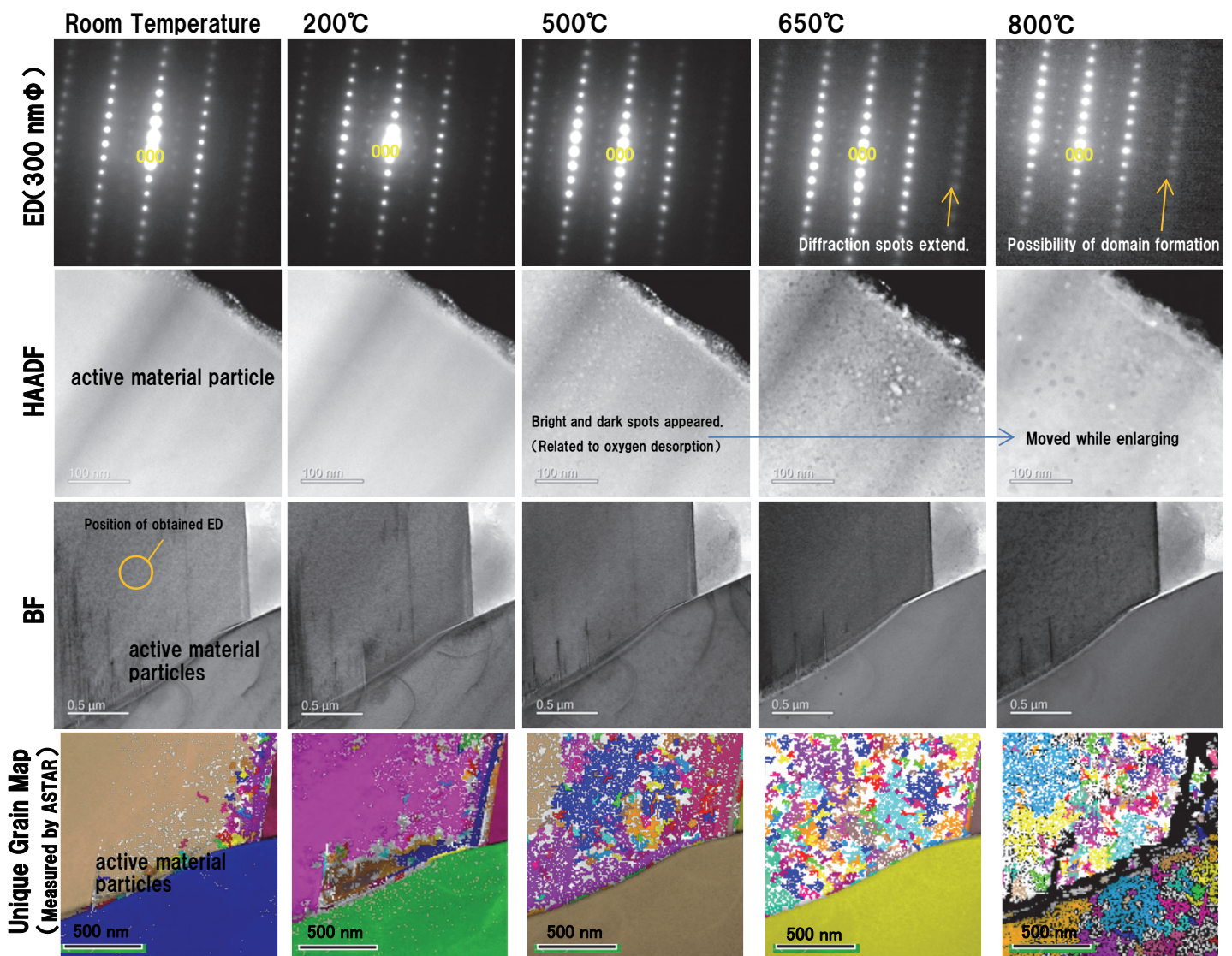
# Heating behavior analysis of LIB cathode active material using *in-situ* TEM and ASTAR

In order to obtain high safety of LIB, it is important to clarify the heating behavior of the active material. By combining STEM observation of temperature rising behavior with *in-situ* TEM and domain structure observation technology with ASTAR, it is possible to give the relationship between temperature rising behavior of the LIB cathode active material and microscopic structural change.

*in-situ* heating STEM observation (ED(Electron Diffraction), HAADF-, BF-STEM) and ASTAR

<Experimental conditions>

Sample: LiCoO<sub>2</sub> particle (Mobile battery pack), Measured after raising the temperature at each 50°C/sec and holding for 10 minutes



With ASTAR, crystal phase separation / twin domain formation can be visualized as a map, and quantitative interpretation is possible.

The heating behavior of the LIB cathode active material can be visualized from multiple viewpoints of diffraction (crystal structure), morphology (shape, crystal defect), and domain structure etc.

By 500°C, morphological and structural changes occur with oxygen desorption. Furthermore, in the higher temperature region, the domain size decreases (the interface increases) as the temperature increases.