

Atomic-resolution imaging of electrically induced oxygen vacancy migration and phase transformation in functional oxides

Zhang, Q.¹

¹ Institute of Physics, Chinese Academy of Sciences, China

Visualizing the process of oxygen ion migration with atomic resolution is highly desirable for designing novel devices such as oxidation catalysts, oxygen permeation membranes, and solid oxide fuel cells. However, it is difficult to observe the oxygen atoms at atomic scale under electric field due to weak scattering of oxygen and the stability of the sample holder. Here we adopted a chip-based configuration to apply the electric bias and obtained show the process of electrically induced oxygen migration and subsequent reconstructive structural transformation in a SrCoO_{2.5} and BiFeO₃ films by a scanning transmission electron microscopy. With help of angular bright field imaging, we find that the formation of oxygen vacancy, its ordering and subsequent structure transition. We analysis the detailed process and discussion the migration mechanism. These direct experimental evidences of oxygen migration may provide a common mechanism for the electrically induced structural evolution of oxides.