Visualization of Oxide-Ion Conduction Path

Katsuhiro NOMURA
Special Division for Green Life Technology
e-mail: nomura-k@aist.go.jp
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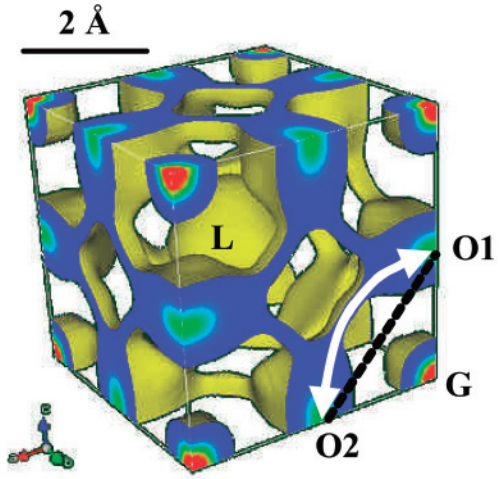
We have analyzed the nuclear density distribution in the perovskite-type fast oxide-ion conductor, $(La_{0.8}Sr_{0.2})(Ga_{0.8}Mg_{0.15}Co_{0.05})O_{3-\delta}$ (LSGMC), to investigate the detailed distribution and conduction path of oxide ions. The nuclear density distribution was obtained by a combined technique including a Rietveld refinement and a maximum-entropy method (MEM)-based pattern fitting of neutron diffraction data measured at elevated temperatures. The oxide ions existed over wide regions perpendicular to the B-site cation (= $Ga_{0.8}Mg_{0.15}Co_{0.05}$) - oxide ion bonds, and showed arc-shape conduction path away from the B-site cations. This result agreed with the oxide ion conduction path so far predicted from the molecular dynamics (MD) calculation.



Visualized oxide-ion (O^{2-}) conduction path and distribution of O^{2-}. L and G refer to the La- and Ga-site, respectively. The conduction path of O^{2-} between two stable positions (O1, O2) is depicted as a curved solid arrow

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Preparation of Highly Fluorescent Composite Nanocrystals by a Microfluidic Reactor

Hiroyuki NAKAMURA
Micro-space Chemistry Laboratory
nakamura-hiroyuki@aist.go.jp
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A Micro-reactor is a continuous flow reactor, which can control reaction temperature and time precisely. We utilized this reactor to prepare a composite particle of ZnS coated CdSe nanocrystals to alter the photoluminescence properties of the nanocrystals. By the coating reaction, the luminescence intensity was improved significantly, and the PL wavelength became large with a coating of second order of reaction time. The precise control of reaction time and temperature by the micro-reactor was considered to be effective to modify the fluorescence intensity without any degradation of particle size distribution. Furthermore, the ZnS coated CdSe nanocrystals were successfully surface-treated and dispersed into water. This hydrophilic Q-dot can be applicable for a novel fluorescence tag for biological detection and analysis.

Photoluminescence from water-soluble ZnS/CdSe nanocrystals prepared by a Microfluidic reactor