Discovery of a new crystal structure family of oxide-ion conductors

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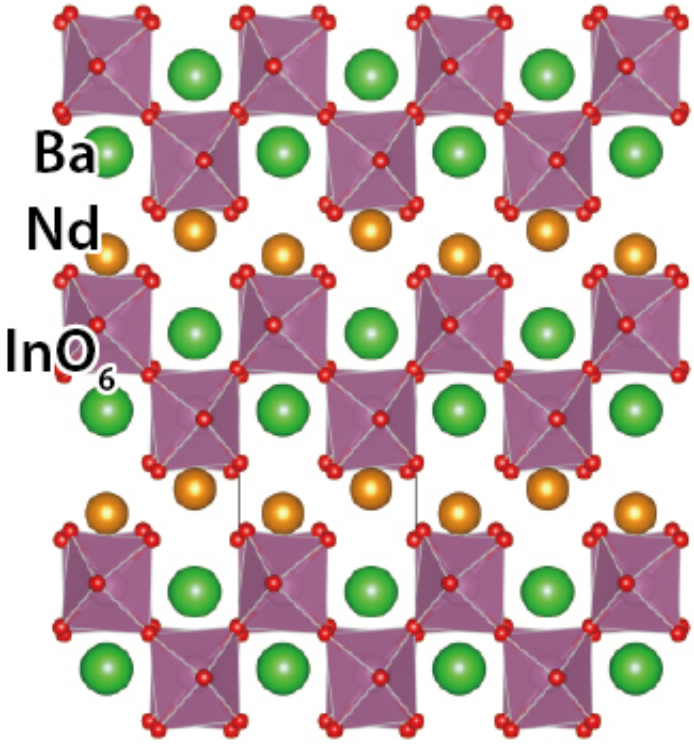

Figure 1. Crystal structure of NdBaInO4

Oxide-ion conducting ceramic materials have received considerable attention because of their potential applications in solid oxide fuel cells, oxygen separation membranes, and gas sensors.

Currently, most research about oxide-ion conducting ceramics is limited

to materials with specific structure-types, such as fluorites, perovskites, K_2NiF_4, mellilites, and apatites. However, it is necessary to investigate new structure-type ceramics for the further development of oxide-ion conductors.

Recently, a research group led by Masatomo Yashima and Kotaro Fujii of Tokyo Institute of Technology discovered the new crystal structure family of oxide-ion conductors of NdBaInO4 using a concept of structure design based on ionic size.

NdBaInO4 was synthesized by a solid-state reaction and the crystal structure was determined from synchrotron and neutron powder diffraction data.

The crystal structure analysis revealed that NdBaInO4 belongs to a completely new structure family. The oxide-ion conduction was confirmed by electrical conductivity measurements. Furthermore, the research group succeeded in improving the oxide-ion conductivity by about 20 times by Sr doping at Nd sites that yielded the composition of $Nd_{0.9}S_{r0.1}BaIn_{O3.95}$.

The discovery of this new material of NdBaInO4 is expected to lead to the development of new ionic conductors for better solid oxide fuel cells, oxygen concentrators, and electronic materials.

More information: Kotaro Fujii et al. Improved oxide-ion conductivity of NdBaInOby Sr doping, *J. Mater. Chem. A* (2015). DOI: 10.1039/C5TA01336D

Kotaro Fujii et al. New Perovskite-Related Structure Family of Oxide-Ion Conducting Materials NdBaInO, *Chemistry of Materials* (2014). DOI: 10.1021/cm500776x

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