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## **Strength, elastic and electrical properties of non-stoichiometric materials under various oxygen partial pressures**

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Fracture strength and Young's modulus of ceria doped with 10 mol.% Gd and 10, 20 and 30 mol.% Y were investigated by means of small punch testing method under controlled the temperature (1073 K) and the oxygen partial pressure ( $\log((p(\text{O}_2)/\text{atm})=-1.1, 17.5, -21.4, -22.0)$ ). Under the reducing conditions, the color of fractured doped ceria specimen changed from pale yellow to gray, it is therefore indicated that oxygen non-stoichiometry affects mechanical properties of the doped ceria. Under the low oxygen partial pressure the Young's modulus of all the specimens decreased monotonically. The fracture strength, by contrast, increased at  $\log(p(\text{O}_2)/\text{atm})=-17.5$ , and under the lower oxygen partial pressure, different variation trends showed each yttria doped cerias with Y contents. The oxygen partial pressure dependence of the fracture strength of doped ceria could be arranged as a function of the reduction expansion of the lattice constant  $a/a_0$ .

### **Biography**

Kazuhiisa Sato holds a PhD in Engineering and now is an Associate Professor of Fracture and Reliability Research Institute and Graduate School of Environmental Studies. He got his Doctor of Philosophy in Engineering degree (PhD), Specialist in Fracture Mechanics and Electrochemistry, at Tohoku University in 2005. He had worked as a COE Fellow at Graduate School of Engineering, Tohoku University, 2005-2006. Then, he had worked as an Assistant Professor, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, 2006-2011. Finally, he has been working as an Associate Professor, Fracture and Reliability Research Institute, Tohoku University, since 2011. His researches focus on the Fracture Mechanics and Electrochemistry in Electrochemical Devices.

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