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## ABSTRACT:

### **Origin and Mechanism of the Multi-step Phase Dismantling Phenomena of Ceria-Zirconia Solid Solution**

Jong-Ho Lee<sup>1</sup>, Seol Hee Oh<sup>1</sup>, Hyun-Kyu Kim<sup>2</sup>, Jason Kim<sup>3</sup>, Yeong-Cheol Kim<sup>2</sup>, Sun-Young Park<sup>1</sup>, Sungeun Yang<sup>1</sup>, Ho-Il Ji<sup>1</sup>, Kyung Joong Yoon<sup>1</sup>, Ji-Won Son<sup>1</sup>

<sup>1</sup> Korea Institute of Science and Technology, Seoul, Korea

<sup>2</sup> Korea University of Technology and Education, Cheonan, Korea

<sup>3</sup> Pohang University of Science and Technology, Pohang, Korea

Over the past decades, CeO<sub>2</sub>-ZrO<sub>2</sub> solid solution have quickly replaced conventional CeO<sub>2</sub> as a catalysts support materials in the three-way catalysts (TWCs) because of its superior oxygen releasing/storing capability. However, the phase stability of CeO<sub>2</sub>-ZrO<sub>2</sub> solid solution has long been controversial as can be inferred from many conflicting reports on its structural or compositional stability. Recently, it was experimentally observed for the first time that the solid solution can be even completely separated into CeO<sub>2</sub> and ZrO<sub>2</sub>, that further amplified the current confusing controversy. Therefore, in order to clarify the exact cause and reaction mechanism of controversial phase evolution phenomena, we performed well defined model experiment with epitaxial Ce<sub>0.75</sub>Zr<sub>0.25</sub>O<sub>2</sub> thin films and systematically observed the detailed structural and compositional changes at each stage of phase evolution process.