

The Development of Innovative Three-way Catalysts via Solvothermal Reactions



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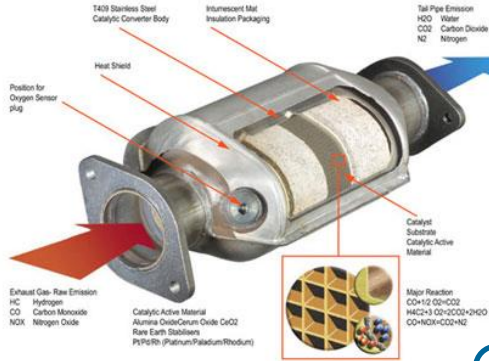


Assist. Prof. Bin LIU

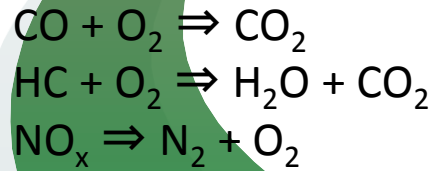
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CeO₂: Automotive three-way catalysts (TWCs)

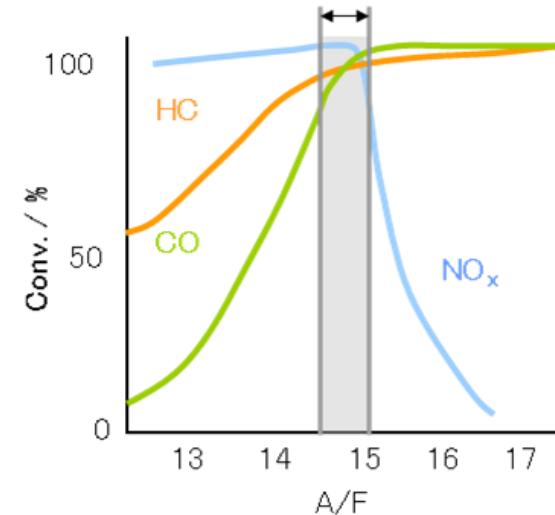
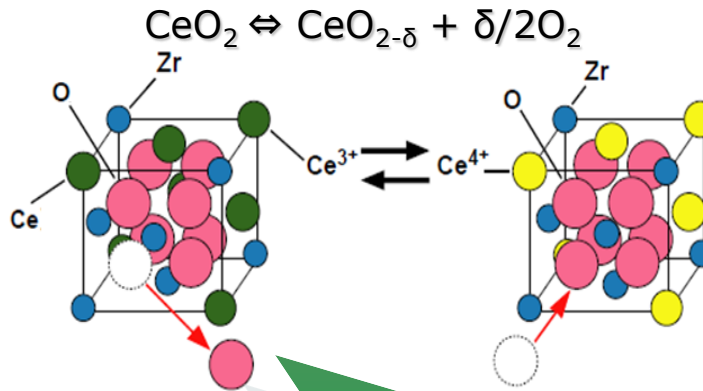
Application



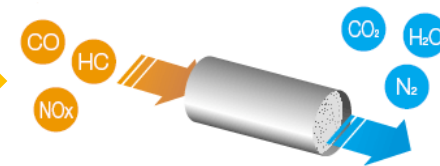
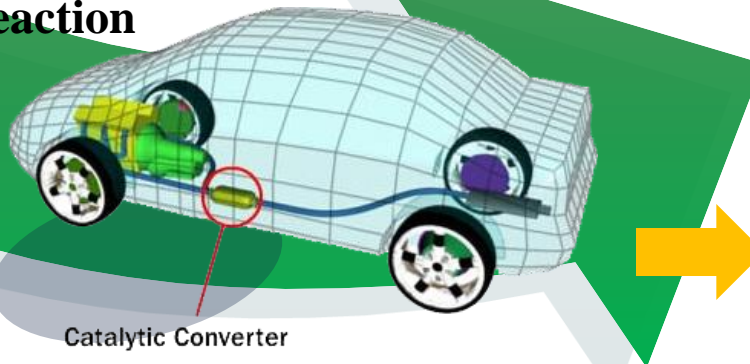
◆ CeO₂ (Ceria)-based materials:
Oxygen storage capacity (OSC)
Air/fuel ratio around 14.7



Oxidation/reduction reaction



The relationship between air/fuel (A/F) ratios and purification rate

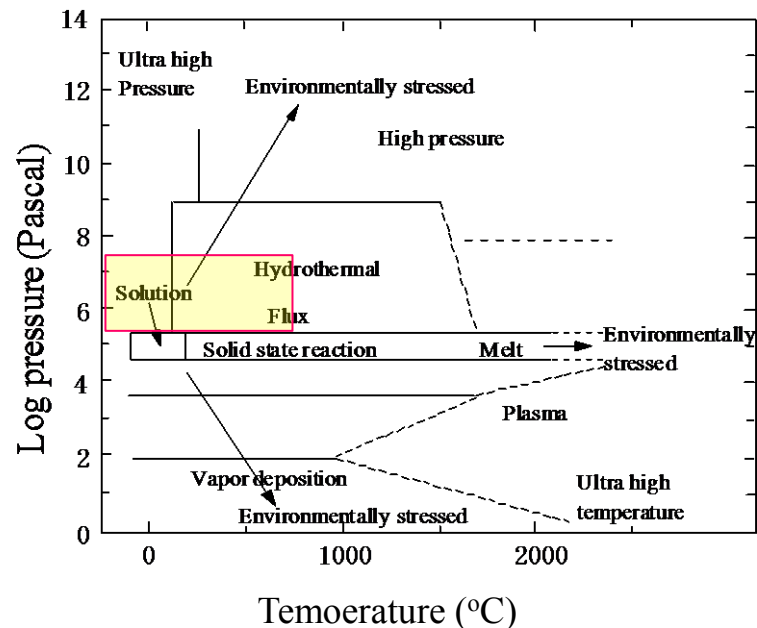
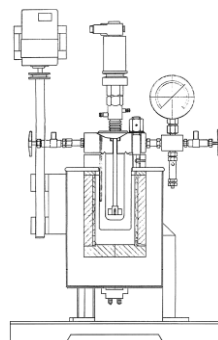
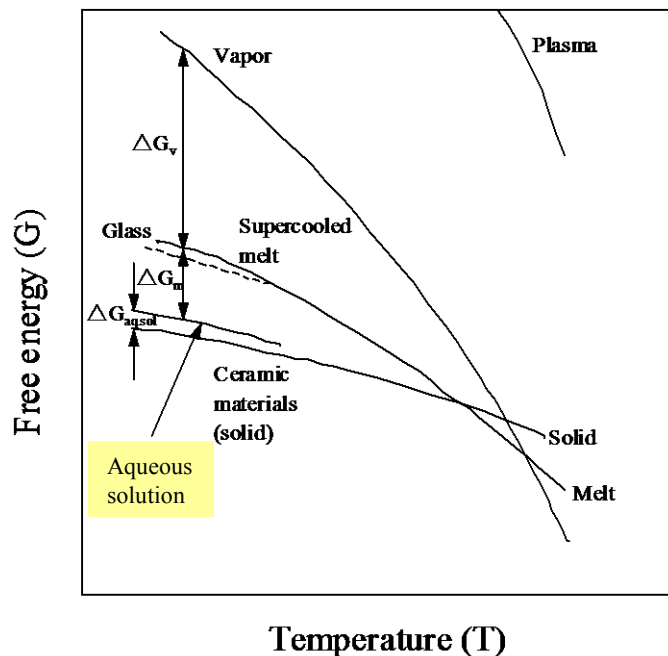


Targets:

- Reduce the amount of rare earth elements / precious metals, because of the increased rare earth price / high environmental load;
- Improve the OSC and the CO oxidation activity.

Solvothermal Process

- A kind of solution process, which is suitable way to synthesize well-crystallized nanoparticles
- An environmental friendly soft chemical process : **Low Environmental Load!**
- An effective way to improve the functionality of inorganic materials.



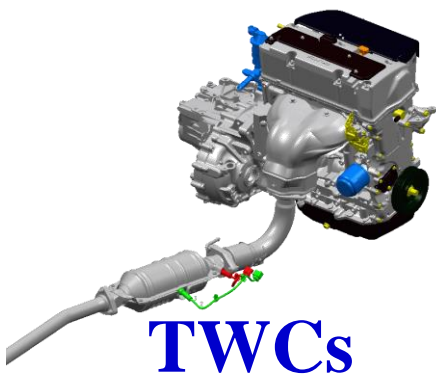
*M. Yoshimura etc. *Solid State Ionics*, **98**, 197-208, 1997

Purpose of the Present Research:

Design the component and control the morphology of

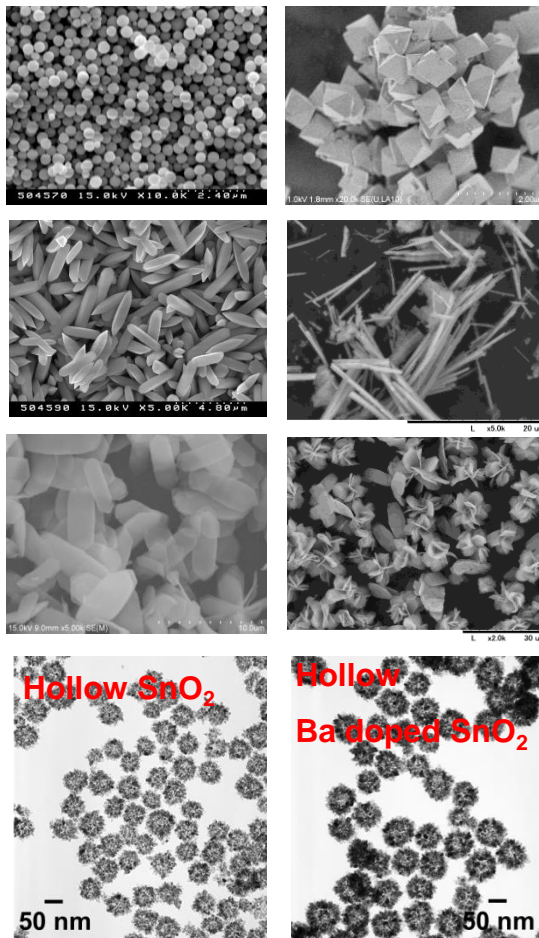
ceria based and non-ceria based catalysts

Innovative Three-way Catalysts (TWCs)

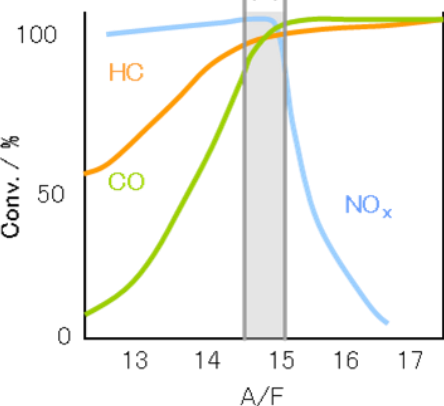


TWCs

Morphology Controllable CeO₂

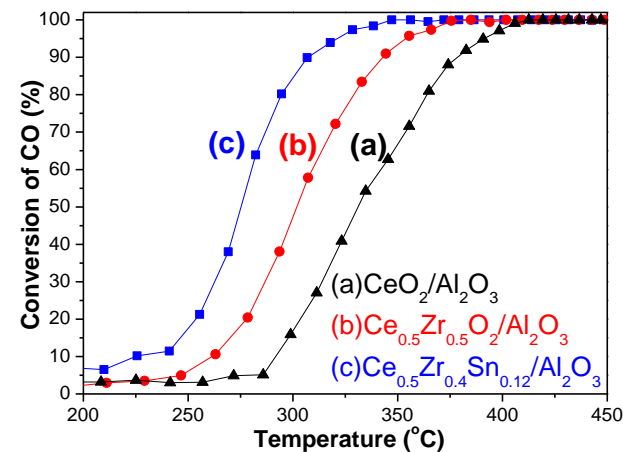
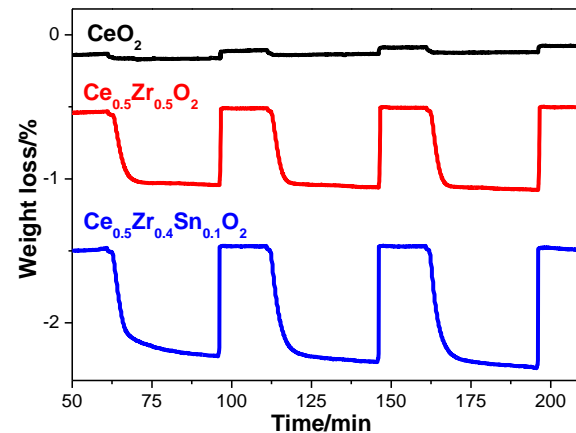


Theoretical A/F = 14.7
A/F Window



Component Design / Morphological Control

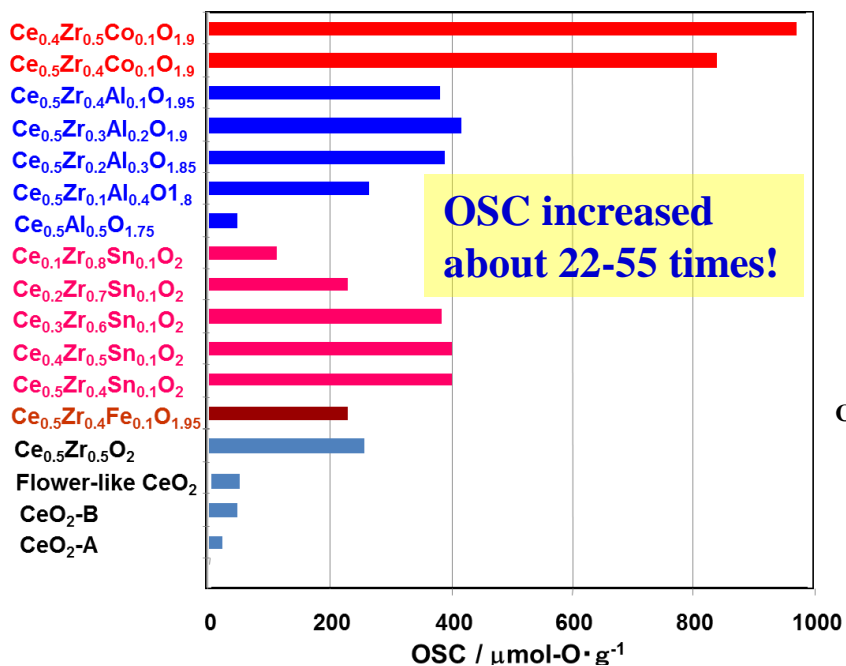
- Environmental purification
- Decrease the CO₂ emission
- Reduce the amount of rare earth elements / precious metals



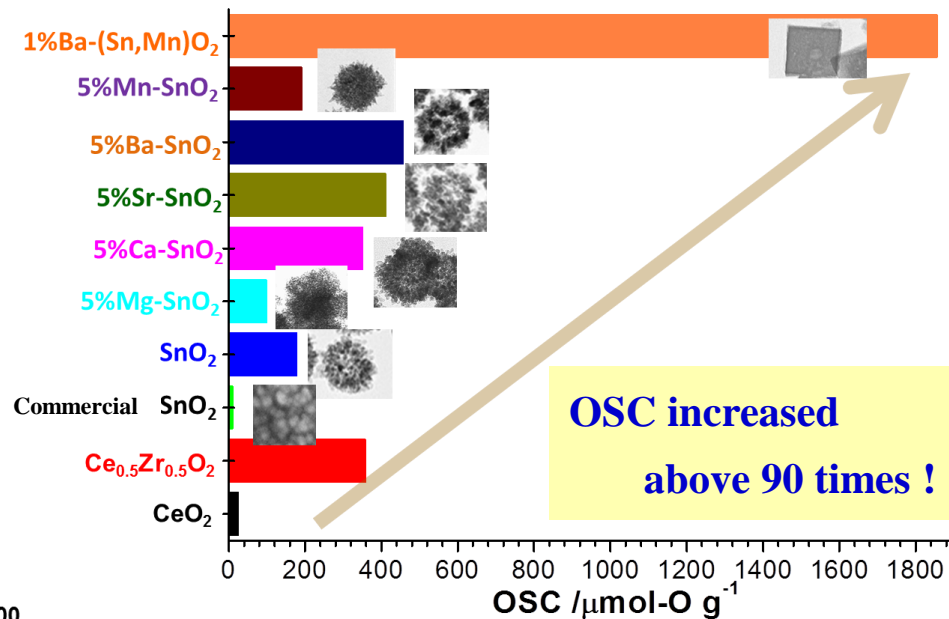
Oxygen storage capacity (OSC),
 CO oxidation property and
 conversion temperature of
 various ceria based catalysts.

Innovative Three-way Catalysts

Ceria Based Catalysts



Non-Ceria Based Catalysts



Please visit our poster presentation booth
for more detailed