Ru Nanoparticles with fcc Structure for High-activity Catalyst

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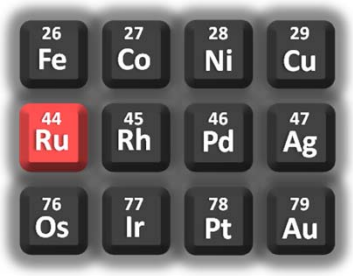
1. Ruthenium Nanoparticles



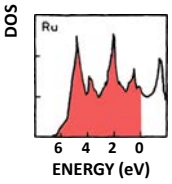
Ruthenium is extensively used as catalyst:

- **Organic synthesis**
- **CO removal from car exhaust or fuel–cell systems**

However,
the conventional synthesis process results in merely the hcp-Ru, meaning that there was no convenient way able to produce fcc-Ru nanoparticles.

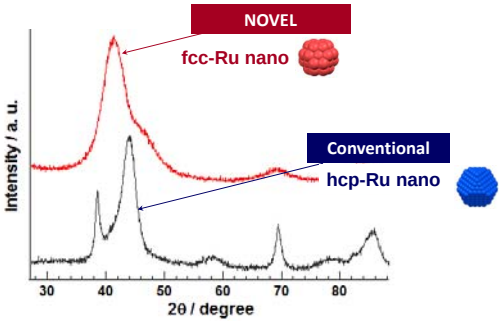
Application example "ENE･FARM" : Ru catalyst is used within the household fuel-cell cogeneration system.

hcp $5s^1 4d^7$



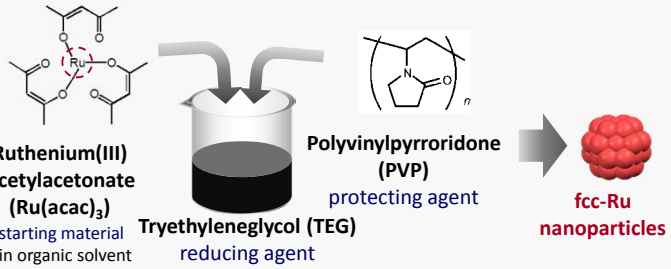
This study successfully meet the demand for synthesizing fcc-Ru nanoparticles, serving as high-active catalyst.

fcc : face-centered cubic
hcp : hexagonal closed packed structure

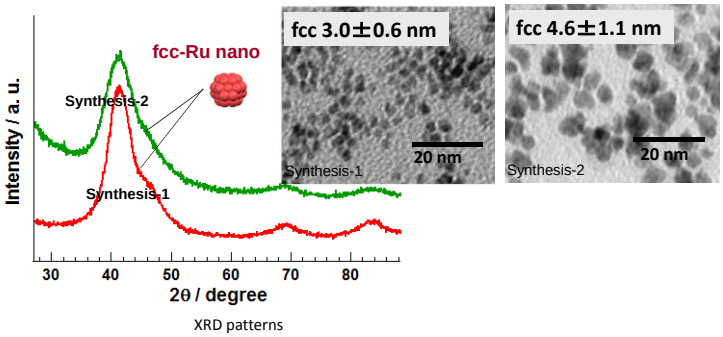


2. NOVEL Synthesis Process

- **Substantial fcc-Ru nanoparticles**
- **Single-step synthesis**
- **Particle size controllable**



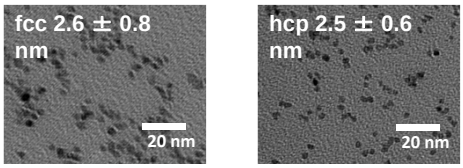
Particle size is controllable by varying the synthesis condition.

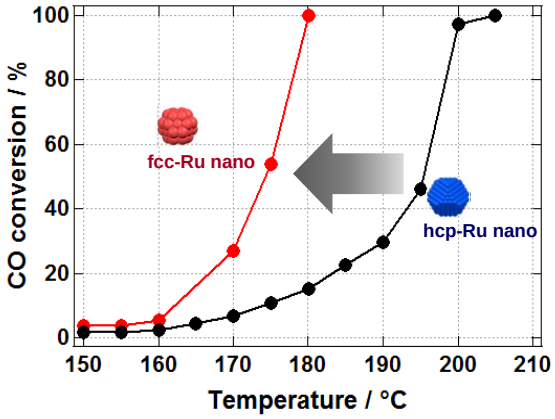


XRD patterns

3. CO Oxidation Catalyst

- **The fcc-Ru catalyst oxidizes carbon monoxide at lower temperature than hcp-Ru catalyst.**





Condition: Catalyst Quantity : 0.075 g, Al_2O_3(γ)-supported Ru
Reaction Gas : He/CO/O_2 = 49/0.5/0.5 (cc/min)
Reaction temperature : 150 ℃～

The fcc-Ru catalyst, firstly prepared by the novel synthesis process, performs significantly higher activity than the hcp-Ru catalyst.

4. Patent available for licensing

Patent No. : PCT/JP2012/005838 (JP, US)

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