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Program Title (English) : Investigation of an adsorption site change for $\text{Cu}_x\text{Ru}_{1-x}$ solid-solution nanoparticles under the CO oxidation environment

Username (English) : O. Seo¹⁾, J. Kim¹⁾, L. S. R. Kumara¹⁾, O. Sakata¹⁾

Affiliation (English) : 1) National Institute for Materials Science

キーワード : *In-situ* XAFS, CO oxidation, Absorption behavior

1. 概要 (Summary)

Local structural changes of bimetallic nanoparticles on the oxide supporting materials under the realistic reaction condition are an important area of research for the design of catalysts, with applications in various fields. The oxidation states, absorption site, coordination numbers, and radial distance on the metal nanoparticles are key parameters in understanding the reaction mechanism. To investigate the atomic scale behaviors of structural controlled fcc and hcp PtRu nanoparticles, we were performed the *in-situ* X-ray absorption fine structure (XAFS) measurement under O_2 , CO, and CO oxidation condition with annealing temperature.

2. 実験(目的,方法) (Experimental)

Synthesizing into a specific crystal structure by controlling the atomic configuration is one of the good ways to enhance catalytic performance or energy conversion efficiency. We have successfully synthesized PtRu solid-solution nanoparticles with fcc and hcp structures.

To understand the CO oxidation process on PtRu nanoparticles, we were performed the *in-situ* XAFS measurement under CO oxidation conditions. The reaction behaviors of CO and O_2 molecules with Pt and Ru atoms on the surface region of nanoparticles under an ambient environment is an important issue. The objective of this beamtime is to investigate variation in the absorption site of the metal surface and local structure on the PtRu solid-solution nanoparticles at different temperatures (300-473 K) under the CO oxidation condition. A comparative study was performed on PtRu solid-

solution nanoparticles as a function of the crystal structure of fcc and hcp. We attempted to elucidate the difference of absorption sites and reactant sites of CO and O_2 during the CO oxidation condition.

3. 結果と考察 (Results and Discussion)

Figure 1 shows the XANES spectra of the fcc and hcp PtRu nanoparticles at the Ru K edge under the CO oxidation condition at 323 and 473 K. We were observed the oxidation ratio of metal NPs under ambient conditions, from evaluated the linear combination analysis of the near-edge position. The oxide ratio is increased with reaction temperature. This means that the surface component is oxidized after the CO oxidation reaction and oxidation is promoted by CO oxidation reaction.

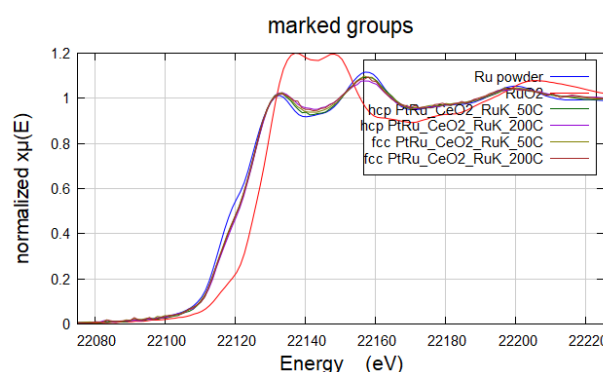


Figure 1. XANES spectra on PtRu solid-solution nanoparticles with fcc and hcp crystal structure under the CO oxidation conditions at 323 and 473 K.

4. その他・特記事項 (Others)

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