第　119　回　応用セラミックス研究所講演会

題目：Controlling the surface structures and tuning the related properties of nano/micro-structured crystallites

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講演内容：

Anisotropy is a basic property of single crystals. Various facets or surfaces have different geometric and electronic structures, dangling bonds etc. Surface dependent physical and chemical properties are very popular in crystals. For examples, different crystal surfaces of Pt crystals exhibit totally different catalytic properties to the catalytic reaction of hexane in the excess H_2 condition. The Pt(111) surfaces cause the aromatization reaction to produce benzene, while the Pt(100) surfaces result in an isomerization reaction, and a cyclization reaction happens on the Pt(755) surfaces. Controls of the structure of exposed surfaces of materials are therefore able to tailor the electronic, optical, magnetic, and catalytic properties of a functional material. Although the exposed surfaces can be controlled by cutting or polishing a large crystal mechanically, for crystallites under microscale, their exposed surfaces can hardly be controlled by other methods than the crystal growth. During crystal growth, chemically active crystal planes usually grow fast and vanish at last. The exposed surfaces in a crystal are usually stable and chemically less active crystal planes. It remains a great challenge to develop general methods for the controllable growth of unusual exposed crystal surfaces. Herein, we report the shape-controlled (surface structure controlled) syntheses of some metals, oxides micro-/nano- crystallites. A general molten salts (including ionic liquids) synthesis route was developed for growing many metal oxides crystallites with all exposed polar surfaces, and some inorganic ions were found to be effective for controlling the exposed surface of metals (such as gold). Furthermore, surface-dependent catalysis, gas sensing and light emissions of ZnO crystallites have been also studied.

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