

# Ultrasonic Vibration Potential of Ceria-Alumina composite particles and effect of the surface composition in water

Masatomo Hattori<sup>1</sup>, Takashi Ishida<sup>1</sup>, Masakuni Ozawa<sup>2</sup>

<sup>1</sup> Graduate School of Engineering of Material Science and Engineering, ,  
Nagoya Institute of Technology, Showa-ku, Nagoya, 466-8555, Aichi, Japan

<sup>2</sup> Ceramic Research Laboratory, Nagoya Institute of Technology  
Tajimi, 507-0071, Gifu, Japan

E-Mail: masatomo.h@crl.nitech.ac.jp

URL: <http://www.crl.nitech.ac.jp/env/index-j.html>

In three-way catalyst, ceria (cerium dioxide) and alumina are used as sub-catalyst and support of catalyst, respectively. The composite particles of them are important for better catalytic performance. In the preparation of catalysts, the rheological properties of slurry are important. Dispersibility of particles is an indicator of the properties, and the surface charge of particles is an important factor for the dispersibility. In this paper, the surface charge of ceria-alumina composite particles was examined using ultrasonic vibration potential (UVP) method for the colloidal solution. We synthesized ceria-alumina composite particles by impregnation method, and measured the UVP, zeta potential ( $\zeta$ ) and pzc (point of zero charge) of them in water. XPS was measured for researching the effect of surface composition on surface charge of these particles in water.

Ceria-alumina composite particles were prepared by wetting alumina with  $\text{Ce}(\text{NO}_3)_3$  aqueous solution. The ratio of  $\text{Ce}(\text{NO}_3)_3$  were 0.5-5mol% for alumina. The precursor was dried and calcined.

The UVP of the composite particles was measured at different pH for aqueous solution including these particles with 0.1M KOH solution.  $\zeta$  and pzc was estimated by the result of UVP measurement.

The UVP and pzc depended on the composite of these particles. The pzc was 7.6-7.9 for the composite particles, 8.3 for alumina 6.8 for ceria. The surface compositions of Ce on particles were estimated by XPS. The result indicated that particle size of ceria increased with Ce-content. The surface charge of ceria-alumina composite particles was affected by both surface composition and the size of ceria particles.

## About Myself



**Name:** Masatomo Hattori  
**Born:** March 16, 1982  
**Nationality:** Japanese  
**Affiliation:** Environmental Materials, Functional Materials, Ceramics Research  
Laboratory, Nagoya Institute of Technology  
Asahigaoka 10-6-29, Tajimi, Gifu 507-0071, Japan  
Tel: 0572-27-6681, Fax: 0572-27-6812  
**Hometown:** Jimokuji, Ama-gun, Aichi, Japan  
**Degree:** D (Nagoya Institute of Technology., Japan)  
**Study:** Automotive catalysts  
**Hobby:** Contrabass, karaoke  
**Favorite Artist:** Yasunori Kawahara (Bassist), Dreams come true  
**Favorite Food:** Sushi, Chinese noodle  
**My Pet:** Dog