In situ observations of the efflorescence and deliquescence processes of single aerosol particles levitated in air by means of a laser trapping technique

F. GUO[1], T. ISHIKAWA[1], S. SENG[2], Y. TOBÓN[2], S. SOBANSKA[2] AND S. ISHIZAKA[1]*

[1] Department of chemistry, Graduate School of Science, Hiroshima University, Higashi-Hiroshima, 739-8526, Japan (*correspondence: ishizaka@hiroshima-u.ac.jp)

[2] Laboratoire de Spectrochimie Infrarouge et Raman, UMR CNRS 8516, Université de Lille, Sciences et Technologies, 59 655 Villeneuve d'Ascq Cedex, France

The fundamental knowledge about hygroscopic properties of aerosols is of primary importance for modeling of the cloud droplet formation processes. Various types of aerosols (*i.e.* mineral/soil dust, insoluble organics, water soluble nitrates, sulfates and organics, black carbon and sea salt) are present in the atmosphere, in which complex chemical reactions take place and give rise to the chemical and morphological heterogeneity within individual aerosol particles. Therefore, it is necessary to investigate individually the hygroscopic properties of single aerosol particles as a function of its chemical compositions and heterogeneity. Using the laser trapping technique, metastable liquid state such as supercooled or supersaturated water droplets can be stably observed [1, 2]. Therefore, the laser trapping technique is a powerful means to study on the hygroscopicity of aerosol particles. In this study, we demonstrate a novel approach for *in situ* observation of the efflorescence and deliquescence processes of single aerosol particles levitated in air by means of a laser trapping technique.

Single micrometer-sized aqueous droplets containing NaCl and $NaNO_3$ were levitated in air by a focused 532 nm laser beam from a CW-Nd:YVO_4 laser introduced to an inverted optical microscope through an objective lens (×100, NA = 1.30). Chemical composition of individual droplets were determined by Raman spectroscopy. After trapping the droplets, the efflorescence and deliquescence processes of the droplets levitated in air were successfully observed by changing relative humidity (RH) of the surrounding gas phase.

[1] S. Ishizaka, *et al.*(2011) *Chem. Phys. Lett.* **506**, 117-121. [2] S. Ishizaka, *et al.* (2014) *Anal. Sci.* **30**, 1075-1079.