

UV Absorption Spectroscopy for Investigation of Ozonated Water

Kochi Univ. Technol.¹, Center for Nanotechnology, KUT.², ORC Manufacturing Co. Ltd.³

°Jun-Seok Oh^{1,2}, Hideki Yajima³, Satsuki Ito^{1,2}, Izumi Serizawa³ and Akimitsu Hatta^{1,2}

E-mail: jun-seok.oh@kochi-tech.ac.jp

UV absorption spectroscopy (UVAS) is well known optical technique to analyze liquid solutions and the UVAS is getting importance of use in plasma activated water (PAW). As our previous studies, PAW contains reactive oxygen and nitrogen species (RONS): hydrogen peroxide (H_2O_2), nitrate (NO_3^-), and nitrite (NO_2^-) in ppm order (or less). [1] However, a couple of study reported the existence of ozone in PAW. Therefore, it is necessary to understand UV absorption spectrum of ozone in water. In the survey of UV absorption of gaseous ozone and ozone in water; the absorption maximum occurs at 254 nm and the intensity is proportional to the ozone concentration. [2]

Here, we prepared ozonated water using a commercially available ozone unit, based on a high voltage creeping discharge of O_2 , associated with gas bubbling in water. We successfully measured the UV absorption spectra. The ozone concentration in water was also measured by chemical probe. The UV spectra of ozonated water are very good agreement with a previous report by R. Suzuki [3] and we can confirm no ozone existed in our PAW.

From the analysis of the measured UV absorption spectra in Fig. 1, it is noted that the conventional method, measuring intensity at a fixed wavelength of 254 nm, provides limited information only ozone concentration. Also, it seems that the method can provide an overestimated value because of the existence of absorption shoulder of H_2O_2 at the same wavelength of 254 nm.

On site, we will discuss more UV absorption spectra of ozonated water and we will introduce an in-situ UV absorption spectroscopic measurement for observing time dependency of production of ozone in water.

Acknowledgments This work was supported by Priority Research Grant, an internal university fund.

References

- [1] J.-S. Oh, E. J. Szili, N. Gaur, S.-H. Hong, H. Furuta, R. D. Short, A. Hatta, *J. Photopolym. Sci. Technol.* **28** (2015) pp. 439-444.
- [2] C. Gottschalk, J. A. Libra, A. Saupe, *Ozonation of Water and Waste Water*, WILEY-VCH 2000.
- [3] R. Suzuki, *Readout* **25** (2002) pp. 29-31.

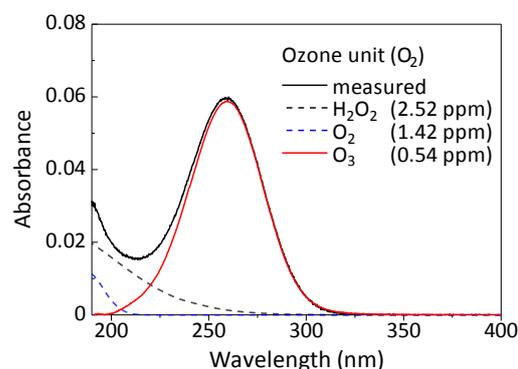


Fig. 1 UV absorption spectrum of ozonated water with curve fitting results.