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Measurement of negative ion mobility with a trace moisture analyzer in O₂ YUI OKUYAMA, SUSUMU SUZUKI, HARUO ITOH, Chiba Institute of Technology — We have been investigated the effects of impurities on the negative ion mobility in O₂ at high pressures including atmospheric pressure using a high-pressure ion drift tube with a positive point plate gap that acts as a negative ion detector [1]. When a small admixture of impurities such as N₂ and CO₂ from atmosphere are existed in O₂, negative ion mobility is increased at $E/N > 1.77$ Td due to formations of NO₂⁻, NO₃⁻, CO₃⁻, CO₄⁻ as impurity ions. In addition, existence of H₂O in O₂ leads to decrease negative ion mobility because O₂⁻·(H₂O)_n forms by ion-molecule between O₂⁻ or O₄⁻ and H₂O [2]. In this work, we describe the experimental results on the measurement of negative ion mobility in ultrahigh-purity O₂ with a trace moisture analyzer (HALO-H₂O). The ion drift tube is mounted in the stainless steel chamber with stainless steel pipes to connect the trace moisture analyzer and O₂ bottle of 99.99995% purity with a gas defecator (MICROTORR: MC200-203). Mobility measurements were carried out after gas flowing, baked and pumped the chamber and gas lines at least two months due to remove impurities. During the measurements, O₂ were flowed through the chamber at 0.5 L/min. As the results, a constant mobility 2.39 cm²/V·s was observed at H₂O concentration between 30 and 100 ppb. This value is good agreement with the polarization limit of mobility for O₄⁻.

[1] Y. Okuyama et al, J. Phys. D: Appl. Phys., 45, 195202 (2012). [2] Y. Okuyama et al, 65th Annual Gaseous Electronic Conference, 57, 8, MW2.00006 (2012).

Yui Okuyama
Chiba Institute of Technology

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