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Measurement of negative ion mobility varying with a little amount of H₂O in O₂ YUI OKUYAMA, SUSUMU SUZUKI, HARUO ITOH, Chiba Institute of Technology — A study of transport properties such as a mobility of charged particles is importance in understanding discharge plasmas. These fundamental data have been collected in some databases. The authors have been investigated the effects of impurities such as H₂O, CO₂, N₂ on the negative ion mobility in O₂ at high pressures including atmospheric pressure [1, 2]. Especially, the effect of a trace amount of H₂O in O₂ could not to be avoided for the mobility measurement due to formation of cluster ions O₂⁻ · (H₂O)_n (n = 1, 2, 3, ...). In this study, the mobility of negative ions was measured in O₂ varying with the H₂O concentration from 100 to 17000 ppb. The H₂O concentration was monitored with a trace moisture analyzer whose operation was based on a photoabsorption method. As the results, a constant mobility of 2.39 cm²/V·s was observed in ultrahigh-purity O₂ (99.99995%, purified with a gas purifier), in which the H₂O concentration was monitored to be between 15 and 100 ppb. This value was good agreement with the mobility of O₄⁻ in previous report [1]. Then, a small amount of H₂O from 2000 to 17000 ppb was added to the ultrahigh-purity O₂. Two kinds of mobilities 2.31 and 2.21 cm²/V·s were observed in H₂O concentration ranges of 2000 - 4600 and 4600 - 17000 ppb, respectively. Former one is good agreement with the mobility observed in high-purity O₂ (99.9999%) [2]. These mobilities are considered to be those of O₂⁻ · (H₂O)_n (n = 1, 2). [1] Y. Okuyama et al, 66th Annual Gaseous Electronic Conference, 57, 8, MR1.00091 (2013). [2] Y. Okuyama et al, J. Phys. D: Appl. Phys., 45, 195202 (2012).

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