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Oxygen reduction reaction on highly-durable Pt/nanographene fuel cell catalyst synthesized employing in-liquid plasma TOMOKI AMANO, HIROKI KONDO, KEIGO TAKEDA, KENJI ISHIKAWA, Nagoya University, HIROYUKI KANO, NU Eco Engineering, Co., LTD., MINEO HIRAMATSU, Meijo University, MAKOTO SEKINE, MASARU HORI, Nagoya University — We recently have established ultrahigh-speed synthesis method of nanographene materials employing in-liquid plasma, and reported high durability of Pt/nanographene composites as a fuel cell catalyst. Crystallinity and domain size of nanographene materials were essential to their durability. However, their mechanism is not clarified yet. In this study, we investigated the oxygen reduction reaction using three-types of nanographene materials with different crystallinity and domain sizes, which were synthesized using ethanol, 1-propanol and 1-butanol, respectively. According to our previous studies, the nanographene material synthesized using the lower molecular weight alcohol has the higher crystallinity and larger domain size. Pt nanoparticles were supported on the nanographene surfaces by reducing 8 wt% H_2PtCl_6 diluted with H_2O. Oxygen reduction current densities at a potential of 0.2 V vs. RHE were 5.43, 5.19 and 3.69 mA/cm2 for the samples synthesized using ethanol, 1-propanol and 1-butanol, respectively. This means that the higher crystallinity nanographene showed the larger oxygen reduction current density. The controls of crystallinity and domain size of nanographene materials are essential to not only their durability but also highly efficiency as catalyst electrodes.

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