

Operando Characterization of Pt-Bimetallic ORR Catalysts for PEFC

Mizuki TADA¹

¹ Department of Chemistry, Research Center for Materials Science/
Graduate School of Science/Institute for Advanced Study, Nagoya University
Furo, Chikusa, Nagoya 464-8602, Japan.
E-mail: mtada@chem.nagoya-u.ac.jp

Polymer electrolyte fuel cell (PEFC) is one of the efficient clean energy production systems and key technology for carbon-neutral society. At the cathode of PEFC, oxygen reduction reaction (ORR) proceeds on Pt-based nanoparticle catalysts under harsh acidic reaction conditions, and there are many chemical events on the cathode electrocatalysts such as ORR catalysis, Pt-redox surface reactions, dissolution and aggregation of Pt nanoparticles, and the migration of radical scavenger. Hard X-ray XAFS is the powerful tool for the *operando* characterization of these events on electrocatalysts under PEFC operating conditions. We developed with a beamline for operando analysis of PEFC systems at RIKEN/SPring-8 and investigated the *operando* characterization of Pt-based cathode catalysts for PEFC. In this talk, our recent works on the preparation and *operando* characterization of PEFC cathode catalysts, and *operando* three-dimensional XAFS imaging of PEFC MEA (membrane electrode assembly).

References:

- [1] Muratsugu, S.; Miyamoto, S.; Sakamoto, K.; Ichihashi, K.; Kim, C. K.; Ishiguro, N.; Tada, M. *Langmuir*, **2017**, *33*, 10271.
- [2] Ichihashi, K.; Muratsugu, S.; Miyamoto, S.; Sakamoto, K.; Ishiguro, N.; Tada, M. *Dalton Trans.*, **2019**, *48*, 7130. (Inside Front Cover)
- [3] Ichihashi, K.; Muratsugu, S.; Matsui, H.; Higashi, K.; Sekizawa, O.; Uruga, T.; Tada, M. *J. Phys. Chem. C*, **2020**, *124*, 26925.
- [4] Wan, X. K.; Samjeske, G.; Matsui, H.; Chen, C.; Muratsugu, S.; Tada, M. *Dalton Trans.*, **2021**, *50*, 6811.
- [5] Matsui, H.; Ishiguro, N.; Uruga, T.; Sekizawa, O.; Higashi, K.; Maejima, N.; Tada, M. *Angew. Chem. Int. Ed.*, **2017**, *56*, 9371.
- [6] Tan, Y.; Matsui, H.; Ishiguro, N.; Uruga, T.; Nguyen, D. N.; Sekizawa, O.; Sakata, T.; Maejima, N.; Higashi, K.; Dam, H. C.; Tada, M. *J. Phys. Chem. C*, **2019**, *123*, 18844.
- [7] Matsui, H.; Maejima, N.; Ishiguro, N.; Tan, Y.; Uruga, T.; Sekizawa, O.; Sakata, T.; Tada, M.; *Chem. Rec.*, **2019**, *19*, 1380.