

Enhancement of oxidative stability of PEM fuel cell by introduction of HO[•] radical scavenger in Nafion ionomer

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The coordination complex of 18-crown-6 ether/cerium ions (CRE/Ce) is embedded in Nafion ionomer between catalyst and membrane layers in fabrication of membrane electrode assembly (MEA). The anti-oxidation effects of CRE/Ce on ionomer and MEA are investigated not only by Fenton's test but also by FT-IR and XPS, ex-situ and in-situ fluoride ion (F⁻) emission rate, and cell performance measurements. While Ce³⁺ plays an excellent role in scavenging HO[•] radicals, CRE alleviates migration of cerium ions out of the ionomer during cell operation. Both ex-situ and in-situ degradation rate tests show that the systems containing CRE/Ce emits much lower amount of fluoride and sulfonate (SO₃⁻) ions than those without CRE/Ce. The open-circuit voltage (OCV) test at low humidity (30%) show that the cell containing the CRE/Ce is still alive even after 300 h operation, while other cells without it are terminated before it.