

Electrochemical stability of Fe-N-C catalyst in an acidic medium

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Electrochemical energy conversion has been expected to play a decisive role in the future energy landscape due to its high efficiency with potential scalability/reversibility. Noble metals, *e.g.* Pt, have been demonstrated promising catalytic activities in various important reactions such as oxygen reduction reactions, but their high cost and scarcity have limited widespread applications of the devices, remaining on-going challenges in development of catalysts free from noble metals. In this regard, non-precious metal catalysts, typically involving Fe-/N-species anchored on carbon substrates (Fe-N-C), have been made a great progress in their catalytic performance to date. Compared to the considerable attentions in activity, however instability of Fe-N-C has hitherto been much less investigated. In this study, degradation mechanisms of Fe-N-C has been investigated employing *operando* spectroscopic analysis: online inductively coupled plasma mass spectrometry and differential electrochemical mass spectroscopy in combination with scanning flow cells. The advanced analytical technologies measured real-time Fe demetallation and carbon corrosion along with simultaneous electrochemical operations. Various strategies for stable operations of Fe-N-C were further suggested.