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Interconversions of nitrogen-containing species on Pt(100) and Pt(111) electrodes in acidic solutions containing nitrate

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Abstract

This work deals with the interconversions of various nitrogen-containing compounds on Pt(111) and Pt(100) electrodes in contact with acidic solutions of nitrate. Via its reduction, nitrate acts merely as the source of adsorbed nitrogen-containing intermediates, which then undergo complex oxidative or reductive transformations depending on the electrode potential. Nitrate reduction to ammonium is structure sensitive on Pt(111) and Pt(100) because it is mediated by *NO, the adsorption and reactivity of which is also structure sensitive. Accordingly, previous knowledge from *NO electrochemistry is useful to streamline nitrate reduction and elaborate a comprehensive picture of nitrogen-cycle electrocatalysis. Our overall conclusion for nitrate reduction is that the complete conversion to ammonium under prolonged electrolysis is possible only if the reduction of nitrate to nitric oxide, and the