Highly soluble Fe(III)-triethanolamine complex relevant for redox flow batteries

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ABSTRACT: Fe-triethanolamine is a promising candidate as anolyte for redox flow batteries (RFBs), owning to its low potential, high solubility and low cost. We report here a new dinuclear structure of this complex at solid state when prepared with a stoichiometric amount of triethanolamine and iron in basic medium, whereas more than two equivalents of ligands are usually used to prepare Fe-triethanolamine for RFBs application. We achieve a calibration curve to estimate Fe(III) concentration in solution and coulometric experiments highlight a one-electron reduction process per iron atom, corresponding to the reduction of the two Fe(III) atoms of the dinuclear complex into Fe(II). A solubility higher than 1.2 mol dm^{-3} can be reached for Fe-triethanolamine with the new synthesis proposed in this work. All-Fe alkaline RFBs implemented with Fe-triethanolamine exhibit good performances in terms of coulombic, voltage and energy efficiencies, and is stable over a hundred of cycles. A power density around 80-120

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