

## Iron(III/II)-triethanolamine redox system in redox flow batteries

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Redox flow batteries (RFBs) are promising candidates as large-scale energy storage systems. The redox system Fe(III/II)-triethanolamine (TEA) is of high interest for RFBs, since it exhibits a high negative cathodic potential, of about -1.06 V (vs. Ag/AgCl 3M KCl), that allows high cell voltages and therefore high energy densities. Cell voltages of 1.35 V can be reached when combined with the iron(II/III)-hexacyanoferrat complex as positive electrolyte [1, 2]. It also operates under alkaline conditions (pH > 13), which allows for the use of less expensive membranes. All-iron based RFBs are cost-effective, show low chemical toxicity, and exhibit minimal contamination due to species crossover, which prolongs the life cycle of the batteries. However, the identities of chemical species involved in electron transfer reactions are not clear, and that is the focus of our work. We show results of investigations on Fe(III/II)-TEA system, under several conditions of pH, metal iron and ligand concentrations, with cyclic voltammetry on a hanging mercury drop electrode (HMDE) and spectrophotometric measurements. The results exhibit evidence of different chemical species depending on the conditions, and provide the basis for further comprehensive investigations of the electrochemical characteristics and electron transfer and mass transport mechanisms in the Fe(III/II)-TEA redox couple.

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