Long-term stable operation of aqueous organometallic redox flow batteries

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Aqueous Organometallic RFB (AMORFB) has been highlighted recently by the advantages based on the use of organometallic complex based electrolyte as redox active material, which has outstanding merits including the unrestricted procurement of raw materials and the easy control of redox potential and solubility through the adoption of coordination chemistry.

However, these are problems regarding the long-term stability of RFBs, and this issue is ascribed to the unstable organic ligands which are easily deformed by the undesirable side reactions and solidification of transition metals. To narrow the gap, in this study, we develop the optimal driving condition of AMORFBs using TiPA and DIPSO coordinated Fe and Co complexes. For that, four complexes (Fe(TiPA), Co(TiPA), Fe(DIPSO), and Co(DIPSO)) were synthesized and the long term stability of AMORFBs using them was evaluated by spectroscopic, electrochemical, and thermodynamic methods. For analyzing the applicability of AMORFBs more specifically, in situ RFB kit was fabricated and the effects of organometallic complexes on the stability and performance of AMORFBs were investigated.