Using cobalt and iron complexes for long-term stable aqueous organometallic redox flow batteries

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Redox Flow Battery (RFB) is one of the Energy Storage System (ESS) that converts electrical energy into chemical energy and converts chemical energy back into electrical energy. The RFB has the advantages of high stability and design independence of capacity and power. However, Vanadium Redox Flow Battery (VRFB), which has been actively studied, has difficulties in commercialization because of the high price of vanadium used as the active material.

In order to solve this problem, we have studied the system of Alkaline Redox Flow Battery (ARFB) which uses cobalt and iron that has a lower cost than the vanadium as active materials. The metal-ligand complex was prepared by using triisopropanolamine (TiPA) to convert the transition metal into an active material under alkaline conditions. Me-TiPA complexes were more stable in strong base electrolyte than Triethanolamine(TEA)-based Me-TEA complexes. We conducted electrochemical and spectroscopic analyzes of these complexes. In addition, RFB using Co(TiPA)/Fe(TiPA) as active materials was stably operated without deterioration of capacity for 100 cycles.