All-iron aqueous redox flow battery using organometallic active materials

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Vanadium Redox Flow Battery (VRFB) which uses vanadium as an active material is one of the most studied RFB. However, due to the high price of vanadium, various active materials for replacing vanadium have been actively studied. Among the various active materials under study, the organometallic active materials have attracted some attention. Organometallic active materials have advantages in that the chemical and physical properties can be controlled by utilizing various ligands and metals.

One of the most studied organometallic redox complex is the iron-triethanolamine complex(Fe(TEA)). However, the Fe(TEA) has an iron reduction problem which limits an actual RFB operation. In this study, we propose the iron-3-[bis (2-hydroxyethyl) amino]-2-hydroxypropanesulfonic acid complex (Fe(DIPSO)). The Fe(DIPSO) has a similar redox potential as the Fe(TEA). However, unlike the Fe(TEA), it was confirmed that the iron reduction did not occur at the Fe(DIPSO). We use Ferrocyanide and Fe(DIPSO) as a posolyte and negolyte active material, respectively. As a result, the capacity of 14.4Ah•L^{-1} and 70% of energy efficiency were achieved at a current density of 80mA•cm^{-2}.