A novel electrochemical cell design and combination of electrodes to improve the performance of cerium-vanadium redox flow battery

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The Redox Flow Battery (RFB) is one kind of the advanced rechargeable batteries, allows energy to be stored in two solutions containing different redox couples with electrochemical potentials sufficiently separated from each other to provide an electromotive force to drive the oxidation-reduction reactions. The Ce(IV)/Ce(III) as the positive half cell combined with V(II)/V(III) couple as the negative half cell has a high standard reduction potential of 1.74 V, was investigated in order to assess its suitability as a novel redox flow battery. To improve the battery energy efficiency, a novel electrochemical cell was designed for a separate charge and discharge process. Different material such as platinum (Pt), dimensional stability anode (DSA) of Ti / RuO2, and steel use stainless (SUS), were considered as the anode material. And the Pt, lead (Pb), and carbon paper (CP) were considered as the cathode material. The charge and discharge oxidation / reduction kinetics for different material electrode were compared studied. The cell current efficiency, voltage efficiency and energy efficiency were tested and calculated.