## Performance improvement of vanadium redox flow battery by doping metal oxide

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The biggest advantage of the RFB is one that uses a redox pair of the same kind in the anode and cathode to overcome the irreversible contamination by cross-over of the stand between the two electrodes. However, disadvantages exhibits lower energy density relatively (13~25 Wh / kg) compared to other energy storage devices. Many laboratories are in effort to increase the ionic reaction active sites through acid treatment or heat treatment of the carbon electrode for efficiency, higher energy density. They introduced functional groups through electrode surface treatment. Many researchers are using catalyst for ion reaction. In this study, by doping Cerium (Ce) oxide, Iron (Fe) oxide, Titanium (Ti) oxide, Tungsten (W) oxide on the carbon electrode the performance improved about more than 10%.