Redox Flow Batteries for Grid Energy Storage

Redox flow batteries are a class of energy storage devices suitable for stationary energy storage applications. The schematic of a redox flow battery is shown below. Advantages of flow batteries include rapid response times, moderate cost, modularity, low maintenance, and flexible operation.

One important feature of flow batteries is the ability to independently maximize the capacity or power capability of the system. Flow battery research efforts at UK-CAER are developing lower-cost, less toxic redox chemistries based on aqueous manganese or iron redox couples with suitable energy and power densities for grid energy storage. Cyclic voltammetry and charge/discharge profiles of the proposed all-Fe redox flow battery are shown in Figures 2 and 3. New, highly conductive carbon electrode materials are also under development, using carbon nanospheres synthesized by hydrothermal synthesis (HTS) from carbohydrate precursors.