Iron (VI) Battery Performance and Stability of Ferrate Cathodes

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Abstract:
In this paper we report on the high power discharge performance and impedance characteristics of potassium ferrate (K_2FeO_4) and barium ferrate ($BaFeO_4$) cathodes in zinc alkaline dry cells. Results from earlier experiments show that ferrate materials promise superior performance over electrolytic manganese dioxide at operating voltages exceeding 1.6 V and currents as high as 100 mA per gram of active material [1]. Unfortunately, high impedance of discharge products limits full utilization of ferrate charge capacity. Traditional carbon based additives can enhance conductivity, but also compromise ferrate stability and accelerate Fe(VI) decomposition. Ongoing studies are investigating the use of nanoparticulate coatings to improve ferrate performance in both alkaline and lithium based electrolytes.

[1] Walz, KA; Suyama, AN; Suyama, WE; Sene, JJ; Zeltner, WA; Armacanqui, EM; Roszkowski, AJ; Anderson, MA. Characterization and Performance of High Power Iron (VI) Ferrate Batteries. Journal of Power Sources, *in press* (2004)

Figure 1. Energy density of ferrate batteries vs electrolytic manganese dioxide

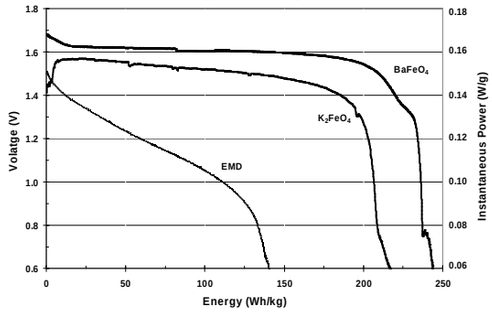

Figure 2. Utilization of active material in discharged ferrate cathodes

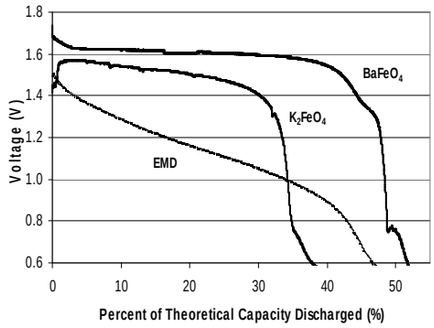

Figure 3. Change in AC impedance upon discharge of a potassium ferrate cell.

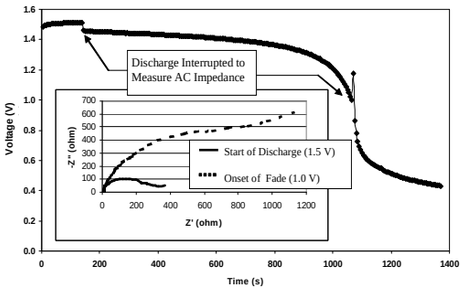

Figure 4. K_2FeO_4 stability in lithium electrolytes