Parametric experimental studies of Ni-H electrochemical cells

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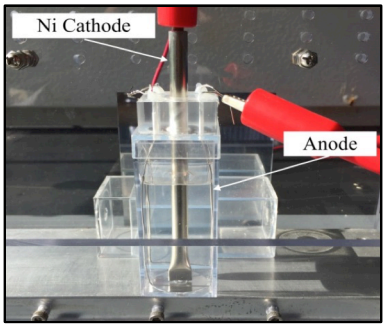
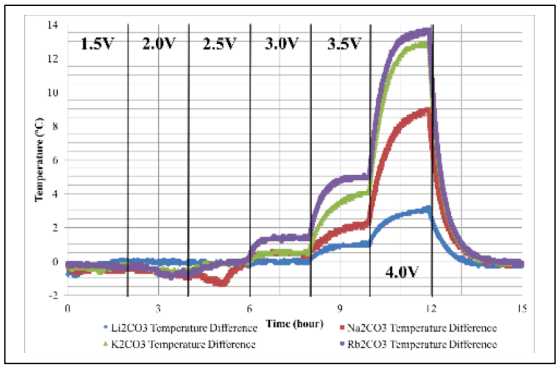
Electrochemical interactions between nickel and protons were heavily studied in the early 1990s and during the following years [1-5]. The Ni-H system is not much studied now, despite the early reports of strong excess power results, and the fact that nickel and light water are significantly cheaper than palladium and heavy water. We are pursuing a three-part research program with experiments, data analyses and simulations aimed at understanding Ni-H electrochemical approaches to producing LENR. This paper reports on experimental results. Two other papers deal with the data analyses [6] and multi-physics simulations [7].



We are using small (26 mm square and 62 mm high on the inside) rectangular cells that are available commercially at modest cost. We added a glued plastic piece to the cap that contains five holes, one for the cathode in the center and four near the corners for the platinum anode wires. The cathode is 99.5% pure nickel tube with an outside diameter of 6.5 mm and a wall thickness of 0.5 mm, which was bought from Goodfellow in the U.K. The use of tubular cathodes has two advantages. The tubes are dimensionally and positionally stable during experiments. And, it is possible to put sensors into the tubes during runs. Two commercial Type J thermocouples are used, one inside of the nickel cathode and one in the air directly above the first. The difference between the two gives the temperature of the cell interior relative to the ambient.

Four alkali metal carbonate electrolytes are studied, following the early experiments, with applied voltages in the 0.5 to 5.0 V range. Besides monitoring temperatures and the current, we are able to record cyclic voltammograms and open circuit voltages, as well as measure five types of spectroscopy (Impedance, Optical Reflection, RF Emission, Sound Emission and Electrical Noise) and record thermal infrared images. The second figure shows example data, the cell temperatures as a function of electrolyte and applied voltage.



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