
INTRODUCTION TO JOURNAL OF POWER SOURCES SPECIAL ISSUE ON NICKEL BATTERIES

This issue of the *Journal of Power Sources* is devoted entirely to an important and still developing group of secondary power sources — Nickel Batteries. The papers range in subject matter from the fundamental electrochemistry of the nickel electrode, through electrode and cell design, to cell and battery performance.

Nickel batteries — Ni/Cd, Ni/Fe, Ni/Zn, Ni/H₂ — are presently, for many applications, the best available amongst secondaries in terms of one or more of the following characteristics usable energy density (gravimetric or volumetric), power density, cycle life. The widespread use of Ni/Cd and, recently, Ni/H₂ batteries for satellites testifies to their fundamental (cost free) performance advantages.

Performance improvements are likely to be forthcoming in terms of energy density and cycle life for all the Ni batteries as a result of new developments. For instance, lighter and stronger substrates or plaques, for the deposition of the active nickel hydroxide, will increase energy density, while increase in cycle life for the Ni/Zn and Ni/Fe cells is likely to be forthcoming from the widespread efforts in development of an electric vehicle battery. However, at the moment, the widely used Ni/Cd cell probably offers the highest cyclability under comparable conditions, although it is outperformed in many applications by Ni/H₂ which has other (additional) performance advantages useful in nonsatellite applications. As the newest Ni battery, Ni/H₂ is presently a strong candidate for bulk energy storage, largely because of its fundamental tolerance of such abuses as overcharge and overdischarge and its extremely long maintenance-free life. Because of its almost exclusive aerospace use to date, there is ample opportunity for cost reduction of Ni/H₂ batteries for terrestrial use. Fuel-cell developments should provide some immediate cost reductions. In terms of cost per cycle, Ni/H₂ may well become the lowest cost secondary battery.

Another trend in the commercial marketplace for Ni batteries is for the powering of portable consumer electronics systems. This market for small secondary batteries which includes such consumer items as: portable computers, video cameras, telephones, games, etc., is rapidly expanding because of the availability of ever-smaller electronic hardware, but its future will depend more and more on increases in battery energy density, power density, cycle life and, of course, cost reduction as the electronics trend inexo-

rably towards increased complexity and lower cost. These are the major challenges in small battery development for the next decade where the proven technology of Ni batteries will provide early market acceptance as improvements are made.

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