



Figure 18.7 Practical specific volumetric energy density (Wh/l) versus specific gravimetric energy density (Wh/kg) for various secondary battery technologies (data from Table 18.4)

The specific energy densities of batteries are an important parameter to characterise the different battery types. For logistic reasons on supplying the batteries to the systems, gravimetric and volumetric energy densities are a relevant cost factor also for autonomous power supply systems. Figure 18.7 shows an overview of the energy densities of different secondary battery technologies based on an analysis of commercially available products. The figure does not show the theoretical limits of the different technologies.

Table 18.4 gives an overview of the most important properties of several secondary electrochemical accumulators. A more detailed description is given on the NiCd (Section 18.4.2), the nickel-metal hydride (NiMH) (Section 18.4.3), the RAM (Section 18.4.4) and the Lithium batteries (Section 18.4.5) as well as on the double-layer capacitors (Section 18.4.6). Lead acid batteries are treated in greater detail in Section 18.4.7. All other battery types have no relevance in the field of autonomous power supply systems. Details on all primary and secondary batteries can be found in [2].

18.4.2 NiCd Batteries

NiCd batteries have been available as a commercial product for many decades and are well-proven products. They have very good properties concerning lifetime and lifetime cycles. They are widely used in heavy-duty applications and in very cold climates. Standard NiCd-battery designs can be operated easily at temperatures of -20°C and specially designed cells can be operated even up to -50°C . Nevertheless, NiCd batteries