UPS (uninterruptible power supply)/stationary batteries: Long idle periods at full SOC; rapid discharge when required (discharge time in the range of 10 min to 1 h, in some applications even longer); designs for lifetimes of up to 20 years available and market grows strongly in connection with the expansion of telecommunications and computer systems. The electrodes are thicker than for SLI applications to withstand corrosion for long periods.

Traction batteries: Application in fork-lift trucks, traction engines, underground mining vehicles and so on; designed for daily complete cycling with moderate currents and regular and controlled complete charging and cycle lifetimes of 1000 to 2000 cycles with 80% DOD can be achieved. The most common electrode technology in these applications is tubular-plate. Flooded batteries show longer lifetimes than VRLA and are widely used.

Electric-vehicle batteries: Widely fluctuating current profile; partial recharging phases (regenerative braking); inadequate lifetimes to date; expanding market and strong competition from other types of battery technology (see Table 18.3). Low gravimetric energy density is a major drawback in this application. Lead acid batteries based on thin pasted lead foils and wounded design are currently under development and are already available in the market from some manufacturers to serve hybrid vehicles[11] that are seen at the moment as a more realistic option than purely battery-powered electric vehicles. Wounded cells have very high power capability and therefore can serve electric motors for accelerating and regenerative breaking.

Batteries for photovoltaic systems: Operating conditions corresponding to the load profiles illustrated in Section 18.3; complete charging very seldom and many partial cycles. Two classes of so-called "solar batteries" are in the market. One class is the modified SLI battery with typically thicker grids than those used in SLI batteries, quite cheap (often from local production in developing countries [17]) but with limited lifetime. The other class of "solar batteries" are modifications from high-quality batteries originally used for cycling or standby applications. In general, flooded batteries show better lifetimes in autonomous power supply systems than VRLA batteries. On the other hand, VRLA batteries have significant advantages concerning electrolyte spillage, maintenance and transport and very little release of corrosive and explosive gases. This reduces the requirements on the battery housing significantly. Therefore, a final choice must be made according to the specific application and the boundary conditions.

Operational experience, however, reveals that the lifetime of batteries in stand-alone applications based on solar energy is in general unsatisfactory compared to battery lifetimes in traditional applications. Batteries in solar home systems normally have to be exchanged after 2 to 3 years and batteries in hybrid systems after 3 to 8 years. Lifetime extensions to 5 years in solar home systems and 10 years in hybrid systems are achievable with advanced batteries designed for the purposes of autonomous power supply systems and appropriate system designs and operation strategies.

[11] Hybrid vehicles have a conventional motor but with less power than in traditional cars. Acceleration is supported by electric motors powered by the batteries. The batteries are charged during regenerative breaking and from the main motor. This concept allows the conventional motor to run with small variations in power and therefore at higher efficiencies. Fuel consumption was reduced with this concept in prototypes down to 2 l/100 km.