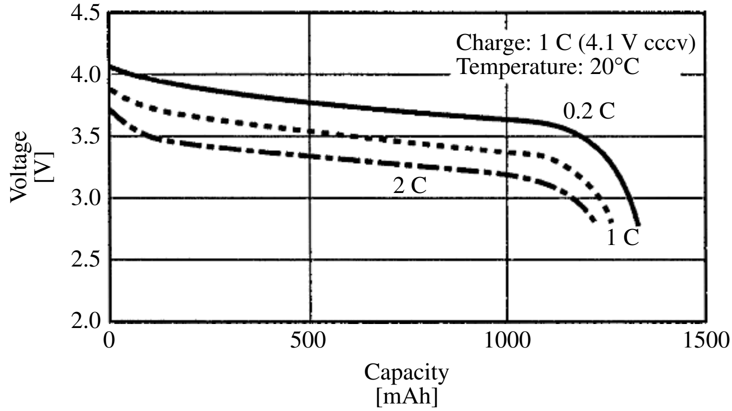

Figure 18.8 Voltage during discharge of a Li-ion battery with $C_5 = 1350$ mAh capacity as a function of the discharged capacity at different discharge currents and a temperature of 20°C. The charging is done with the constant current–constant voltage (cccv or *IU*, see Sub-section 18.4.7.6.1) regime with a charge current of 1 C and an end-of-charge voltage of 4.1 V [14]

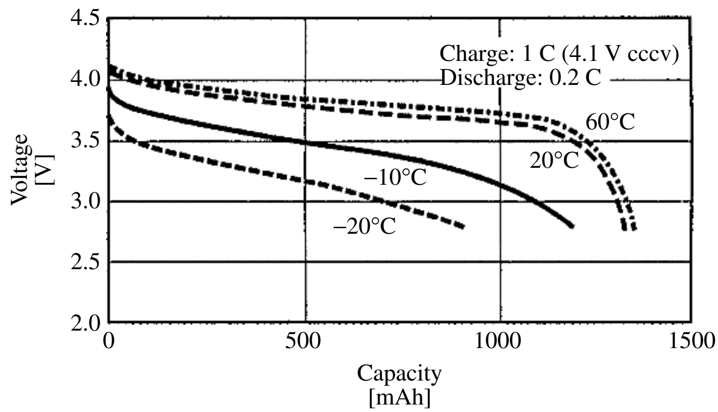

Figure 18.9 Voltage during discharge of a Li-ion battery with $C_5 = 1350$ mAh capacity as a function of the discharged capacity at different battery temperatures at a discharge current of 0.2 C. The charging is done as in Figure 18.8 [14]

only depends on the electrostatic effect. However, in contrast to classical capacitors in which in the dielectric only electrons are moved, in double-layer capacitors a movement of ions and therefore a significant mass movement occurs. This results in diffusion-time constants during charging and discharging in the double-layer capacitor.

Depending on the electrode material, the capacity is approximately 20 to 40 $\mu F/cm^2$. The electrode materials are typically made of carbon with very high surface areas of approximately 2000 m^2/g. The number of charge carriers in the double layer is limited because with increasing charge-carrier density the potential increases. If the potential is too high, the charge carriers are forced to penetrate the electrode/electrolyte interface resulting in electrochemical reactions like in secondary batteries. However, in this case