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Lithium, the lightest and one of the most reactive of metals, having the greatest electrochemical potential ( $E^0 = -3.045$  V), provides very high energy and power densities in batteries. Rechargeable lithium-ion batteries (containing an intercalation negative electrode) have conquered the markets for portable consumer electronics and, recently, for electric vehicles.

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Electrochemical batteries. Fuel cells. Electrochemical batteries convert chemical energy directly into electrical energy and provide DC current. A battery consists of electrochemical cells that convert stored chemical energy into electrical energy. When two dissimilar metals are immersed in an electrolyte (conductive liquid), the breakdown of chemicals into charged particles (ions) results in a flow of electricity when the battery is connected to an external circuit.

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Chapter 1 of the book is about primary and secondary batteries which include fuel cells and metal-air cells. Fuel cells and metal-air cells convert the energy of electrochemical reactions directly into low voltage, direct current electricity. Since this conversion does not involve a heat stage, which would impose the constraints of the Carnot cycle, the thermodynamic efficiency can be at least twice that of a thermal power plant.

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