There are two important differences between the voltaic cell and the electrolytic cell.

1. The anode and cathode of an electrolytic cell are connected to a battery or other direct-current source, whereas a voltaic cell serves as a source of electrical energy.
2. Electrolytic cells are those in which electrical energy from an external source causes *nonspontaneous* redox reactions to occur. Voltaic cells are those in which *spontaneous* redox reactions produce electricity. In an electrolytic cell, electrical energy is converted to chemical energy; in a voltaic cell, chemical energy is converted to electrical energy.

Electroplating

An electrolytic process in which a metal ion is reduced and a solid metal is deposited on a surface is called **electroplating.** An electroplating cell contains a solution of a salt of the plating metal, an object to be plated (the cathode), and a piece of the plating metal (the anode). A silver-plating cell contains a solution of a soluble silver salt and a silver anode. The cathode is the object to be plated. The silver anode is connected to the positive electrode of a battery or to some other source of direct current. The object to be plated is connected to the negative electrode.

A cell in which silver is being electroplated onto a bracelet can be seen in **Figure 14.** Silver ions are reduced at the cathode according to the following half-reaction and deposited as metallic silver when electrons flow through the circuit.

$$\overset{+1}{Ag^+} + e^- \longrightarrow \overset{0}{Ag}$$

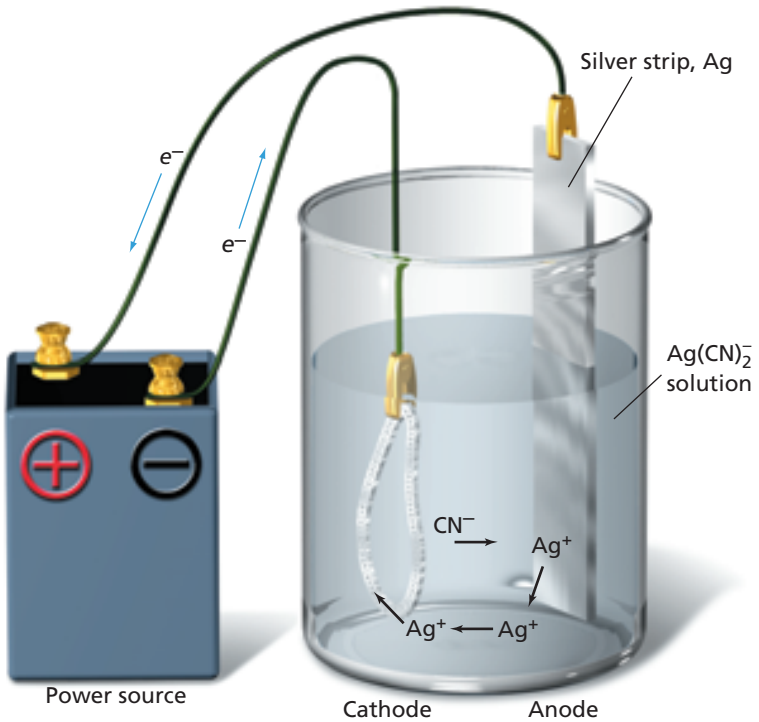

FIGURE 14 The bracelet in this cell is being coated with a thin layer of silver. Silver ions are replaced in the solution as the pure silver anode dissolves.