A 50.00 ml aliquot of a 0.010 M solution of Cu(NO₃)₂ is added to 100.00 ml of a 0.10 M Zn(NO₃)₂ solution. Small pieces of zinc metal and copper metal are added and continuously stirred. Does a reaction occur? If so, what are the products of the reaction and why? What would you expect to observe as the reaction proceeded?

\[
\begin{align*}
\text{Cu}^{2+} + 2\text{e}^- & \leftrightarrow \text{Cu}(s) \quad E^0 = 0.339 \text{ V} \\
\text{Zn}^{2+} + 2\text{e}^- & \leftrightarrow \text{Zn}(s) \quad E^0 = -0.762 \text{ V}
\end{align*}
\]

\(\text{Cu}^{2+}\) is a much stronger reductant than \(\text{Zn}^{2+}\). Therefore the following reaction has a very large equilibrium constant.

\[
\text{Cu}^{2+} + \text{Zn}(s) \rightarrow \text{Cu}(s) + \text{Zn}^{2+}
\]

The reaction essentially goes until all of the \(\text{Cu}^{2+}\) has reacted.

The products are \(\text{Cu}(s)\) and \(\text{Zn}^{2+}\). The reaction occurs on the surface of the pieces of zinc. A coating of copper forms on the surface of the zinc.