

Electrolysis Occurring at Unconnected Electrodes

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When we did an experiment on electrolysis using mechanical pencil leads as electrodes, one of the electrodes happened to be broken and fell into the electrolytic solution. The experiment was carried out without removing the fallen lead. We found that electrolysis occurred at the fallen lead unconnected to the electrodes. Experiments were carried out in petri dishes with an unconnected electrode placed in the electrolytic solution between the anode and the cathode. Three parameters were varied among the experiments: i) distance between the anode and the cathode. ii) distance between the unconnected electrode and the anode or the cathode. iii) length of unconnected electrode. As a result, redox reactions at the unconnected electrodes occurred not only between the anode and the cathode but also outside of them. This phenomenon was observed when the electrodes were laid along the electric flux lines. Induced polarization occurs on the surface of the unconnected electrodes where difference of electric potential gradient between the unconnected electrode and the anode or the cathode is large. When induced electric potential difference along the length unconnected electrode is equal to decomposition voltage, reactions at the unconnected electrodes occurred. These facts were verified by our experiments. The driving force of the chemical change at an unconnected electrode is voltage, and the balance between positive and negative charges are lost. Cations and anions in the electrolytic solution are reduced and oxidized respectively to compensate for these unstable conditions. These results are unprecedented.

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