

Faraday Provides a Spark

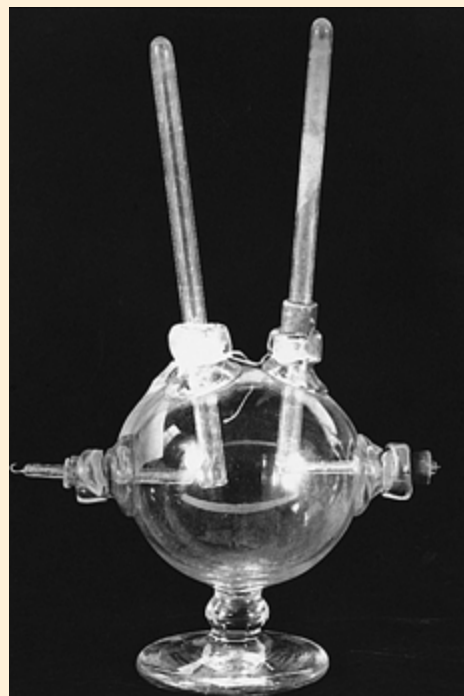
Although Michael Faraday is best remembered for his work in electromagnetism, he began his career as Humphry Davy's laboratory assistant at the Royal Institution in London and went on to be the professor of chemistry there for over 30 years. In the 1830s, Faraday devised several ingenious experiments to determine whether the current in an electrolytic solution is dependent solely on the contact of the battery's poles with the solution. In a typical setup, one of the poles was separated from the solution, and electricity was permitted to enter the solution by way of a spark. In all cases, Faraday observed current in the electrolytic cell despite one or both of the poles not being in direct contact with the electrolytic solution. In 1833, he made the hypothesis that the process of electrolysis was due to the intrinsic properties of the metals in solution and the effect of current on these properties.

Although the battery's poles were, in fact, later shown to play a part in the current, Faraday had established the active role of the electrolytic solution in electrolysis. And in realizing that electricity affected the chemical nature of the solution, he anticipated the ideas of oxidation and reduction despite that the concepts of electrons and ions were unknown at the time.

Faraday's Legacy

Faraday continued to study the role of the electrolytic solution, or electrolyte, as he named it, in electrolysis. He also coined most of the other modern terms of electrolysis, including *electrode*, *ion*, *anode*, *cathode*, *anion*, and *cation*. These investigations culminated in the discovery of his basic laws of electrolysis.

Still valid today, these principles put electrolysis on a quantitative footing, leading to our current understanding of the phenomenon. They also bolstered the atomic theory, which was still seriously contested by many chemists at the time. And perhaps most important, Faraday's experiments inspired his successors to further clarify the chemical nature of solutions. This ultimately led to Svante Arrhenius's theory of electrolytic dissociation and the evolution of a new division in the chemical field, known today as *physical chemistry*.



▲ Michael Faraday used this instrument in his studies of electrolysis.

Questions

1. To which scientist does this feature give the most credit for the initial understanding of the basic nature of electrolysis? Briefly summarize his contributions in this area.
2. How are amounts of hydrogen and oxygen gas made from the electrolytic decomposition of water related to the chemical formula of water?

SciLinks
Developed and maintained by the
National Science Teachers Association

For a variety of links related to this chapter, go to www.scilinks.org

Topic: Electrolysis
SciLinks code: HC60479