

# This Week's Citation Classic

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**Gerischer H.** Electrochemical behavior of semiconductors under illumination. *J. Electrochem. Soc.* 113:1174-81, 1966.  
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The concentration of the minority carriers of a semiconductor and correspondingly their free energy can be changed drastically by illumination. The consequences of this effect for the reactions at the semiconductor-electrolyte interface are outlined and demonstrated for redox reactions and the photodecomposition of solids. [The SCI® indicates that this paper has been cited in over 115 publications since 1966.]

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"This paper was delivered as an invited contribution to a symposium on electrode processes organized for the Electrochemical Society by E. Yeager at its spring meeting in Philadelphia. All the papers of this symposium were published in the November issue of the journal of this society. The predominant subjects of the electrochemists in those years were metal electrodes with their complicated double layer problems (with emphasis on adsorption and chemisorption at the interface to the electrolyte) and their manifold kinetic questions. Semiconductors as an electrode material were still considered quite exotic and very few laboratories had started to study such materials. However, some electrochemists had already begun to imagine that a new area of electrochemistry was coming into existence with interesting implications for theory and future technology. The 1966 paper gave to some extent a summary of results published before in German journals in the German language.<sup>1-5</sup> It explained briefly the underlying principles and showed some new experimental results obtained with various semiconductors. That this paper is cited so frequently may have its reason in the demonstration of relatively

simple concepts for the description of kinetic processes at the semiconductor-electrolyte interface under illumination, particularly for the process of photodecomposition. It further demonstrates the importance of summarizing articles and the neglect of papers published in languages other than English.

"My personal interest in semiconductors as material for electrochemical research reaches back to my association with the Max-Planck-Institute of Metals at Stuttgart (from 1954 to 1962) where I—in contrast to the name of the institute—started in the year 1957 to investigate germanium electrodes. Most of my publications in this field during the following years were in German. My interest in this area was born from the idea that correlations between solid-state properties and surface reaction kinetics should be most pronounced and easiest to exemplify with materials where strongly directed and mainly covalent bonds are predominant. Semiconductors, available in the form of single crystals, offer such properties and my expectations—though rather vague in the beginning—have been fully confirmed since then.

"An explosive increase of interest in this field was aroused in the early-1970s by the hope of employing semiconductor electrodes in devices for solar energy conversion. In contact with a suitable redox electrolyte, a Schottky barrier is formed which under illumination generates a photovoltage. This photovoltage can be used to produce electricity or to store the converted energy in the form of chemicals. A recent summary is given in 'Heterogeneous electrochemical systems for solar energy conversion'<sup>6</sup> and in *Photoeffects at Semiconductor-Electrolyte Interfaces*.<sup>7</sup> Although the efficiency of this type of light energy conversion is still unsatisfactory and many technical problems have to be overcome before this technique can be used, the great popularity of this field is largely based on this hope. In my own opinion, however, the contribution of the study of semiconductors and their photoreactions to the fundamental understanding of surface processes may finally be still the more important aspect."

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