

SF-P009

The Chemically Induced Hot Electron Flows on Metal–Semiconductor Schottky nanodiodes During Hydrogen Oxidation

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Mechanism of energy conversion from chemical to electrical during exothermic catalytic reactions at the metal surfaces has been a fascinating and crucial subject in heterogeneous catalysis. A metal-semiconductor Schottky nanodiode is novel device for direct detection of chemically induced hot electrons which have sufficient energy to surmount the Schottky barrier. We measured a continuous chemicurrent during the hydrogen oxidation under of 760 Torr of O₂ and 6 Torr of H₂ by using Pt/Si and Pt/TiO₂ nanodiodes at reaction temperatures and compared the chemicurrent with the reaction turnover rate. The thermoelectric current was measured by carrying out an experiment under O₂ condition for elimination of the background current. Gas chromatograph and source meter were used for measurement of the chemical turnover rate and the chemicurrent, respectively. The correlation between the chemicurrent and the chemical turnover rate under hydrogen oxidation implies how hot electrons generated on the metal surface affect hydrogen oxidation.

Keywords: Catalytic reaction, Chemicurrent, Hydrogen oxidation, Schottky nanodiode, Pt/TiO₂, Pt/Si