

Physikalisches Kolloquium

Proton release at the TiO₂-water interface

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Finding a clean and renewable energy source to replace fossil fuels has attracted much attention, the past few decades, as a requirement for the sustainable development of societies. Direct hydrogen generation on TiO₂ by photocatalytic dissociation of water using sunlight was already proposed more than 40 years ago. However, despite extensive work in this area, the fundamentals of the process remain ill-understood, mainly due to the lack of a proper tool to specifically explore the interface between water and TiO₂. Sum frequency generation spectroscopy (SFG), is an inherently surface sensitive tool, allowing the study of the water-TiO₂ interface. In a sum frequency generation process a visible and an infrared laser beam are combined at the interface and the vibrational spectrum of solely the molecules at the interface can be obtained. In this way we can specifically study the water molecules at the TiO₂ surface. As a first step in understanding the water splitting reaction, we studied the binding of water to the substrate. We present data on water in contact with various types of TiO₂ substrates. From the intensity and frequency of the SFG signal we extract information about the binding of water to the TiO₂. Moreover, we show time-resolved SFG data after excitation of the TiO₂ with a femtosecond UV pump pulse which mimics the sun light. Preliminary data show that both the surface and the interfacial water molecules undergo changes on ultrafast timescales upon excitation. These UV-pump SFG-probe data illustrate the first steps towards following the photo-induced dissociation of water at the TiO₂ interface in real-time.

Der Gast wird betreut von Frau Prof. Dr. Ziegler

Gäste sind herzlich willkommen

Kaffeeauschank ab 17:00 Uhr

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Gebäude 46 / Raum 46-270