# IAP Seminar


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**Tuesday, 24th May 2022, 16:00 s.t.**
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

**The seminar will be also held as a Zoom Meeting**
https://tuwien.zoom.us/j/91946055872?pwd=ODRqZHdWTDdyOVR2emZ5WllGcFY0dz09
Meeting-ID: 919 4605 5872
Passwort: 65nXfJ0v

## Photocatalysis of Alcohols on Bare and Metal Cluster-Loaded $TiO_2$(110)


Since the photoelectrochemical water splitting experiments by Fujishima and Honda in the seventies, photon-driven hydrogen evolution has been considered to be a realistic dream reaction. Titanium dioxide, the electrode used in their study, remains the most frequently investigated photocatalyst material to this day. Despite the effort in photo(electro)chemical research, there is still no consensus about fundamental mechanistic aspects, mainly due to the complexity and heterogeneity of applied systems.
By conducting alcohol photocatalysis on $TiO_2$(110) single crystals in ultra-high vacuum, we elucidate fundamental chemical mechanisms on the surface. The research efforts of the past decade on this system show that all types of alcohols undergo the same redox chemistry. It is clear that a co-catalyst, usually in the form of small metal clusters, is necessary for photocatalytic hydrogen evolution. We discriminate the redox chemistry, which is dictated by the semiconductor, from the hydrogen evolution reaction, which is enabled by the metal cluster co-catalyst. This allows to establish a closed catalytic cycle different to the conventional electrochemical picture, and comprehensively explains the photocatalytic reactivity of alcohols on $TiO_2$(110). This accounts even for tertiary alcohols, which are hard to oxidize selectively using wet chemical methods but can be oxidized in a truly catalytic manner in this system. The results not only broaden the scope of conventional organic chemistry but also have important implications for applied photocatalysis.


All interested colleagues are welcome to this seminar lecture
(45 min. presentation followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

Ulrike Diebold
(Seminar Chair)