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Photocatalysis at TiO2 Surface on its Real Time

Wednesday 28 August 2024 18:00 (15 minutes)

An acute understanding of photocatalytic reaction dynamics on metal oxides is crucial for the efficient development of technology used for self-cleaning surfaces and for air and water purification. By utilizing femtosecond X-ray laser pulses synchronized with an optical laser (1.6 eV) at FLASH in Hamburg we were able to directly follow the reaction dynamics during photocatalysis at the surface of anatase TiO2 (101) for different prototypical systems; CO/O2/TiO2 and H2O/TiO2. This technique allowed us to monitor the dynamics of reaction product formation with high chemical sensitivity and in real ultrafast time scale.
The femtosecond resolution soft X-ray photoemission spectroscopy results are combined with theoretical calculations to provide crucial insight concerning reaction mechanisms and dynamics. Furthermore, the observation of subtle transient core level shifts provides information on interfacial charge transfer during the initial steps of the reaction immediately following the formation of the photogenerated charge carriers [1,2].

References
[1] Photoinduced Dynamics at the Water/TiO2(101) Interface, Phys. Rev. Lett. 130 (2023) 108001.
[2] Ultrafast Real-Time Dynamics of CO Oxidation over an Oxide Photocatalyst, ACS
catalysis 10 (2020) 13650 −13658.

I plan to submit also conference proceedings

No

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