

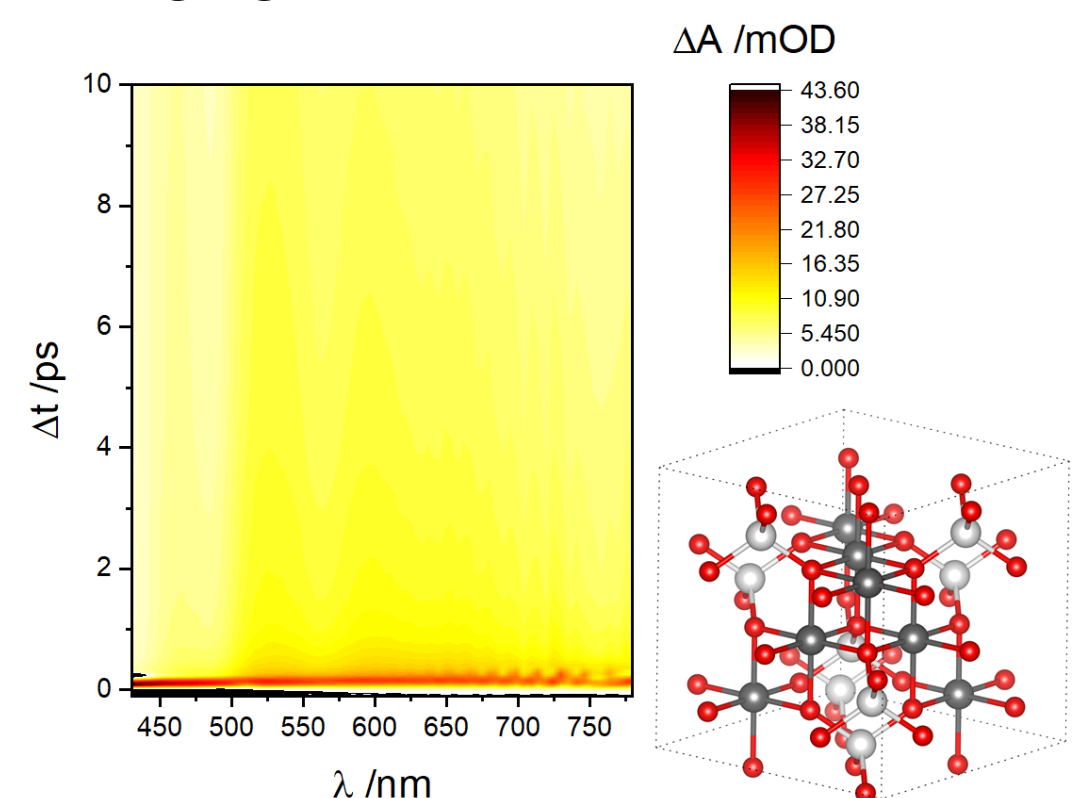
CHYN MEETS HARBOR

Transient dynamics in iron spinel thin films after photoexcitation - Anke Puchert

Ni based heterogeneous catalysts for CO₂ valorization Dr. Jagadesh Kopula Kesavan

Abstract Talk 1: Iron oxides are a versatile class of minerals that have been considered as potential candidates for solar energy conversion due to their beneficial properties: Besides being non-toxic, inexpensive and stable in aqueous conditions, they also have a suitable band gap in the visible. But they also have some shortcomings, which limit their potential for application in solar energy conversion, namely a short hole diffusion and high photon penetration length, which ultimately limit the intrinsic free charge carrier lifetime. Detailed understanding of their photophysical properties is necessary to overcome these limitations and design better performing devices. Transient UV-vis absorption experiments provide insights into early charge carrier dynamics upon valence- to conduction band excitation. The excited charge carriers subsequently relax to the band edges and recombine, thereby changing the absorption compared to the unexcited sample along the way.

We have examined the time-resolved response of iron, zinc and nickel ferrite in the visible after photoexcitation with a 400 nm pulse. Of all samples nickel ferrite shows prolonged charge carrier dynamics more than four times longer than the other two samples. All samples exhibit a persisting offset that remains beyond the maximum delay of our setup. Comparing these long-delay spectra with thermal difference spectra show remarkable similarities between both spectra, indicating the formation of a thermalized state within 1 ns.



Abstract Talk 2: Conversion of environmental pollutant CO₂ emitted by anthropogenic activities into valuable products offers a feasible way to reduce the CO₂ accumulation in the atmosphere and balances the carbon cycle. Combining CO₂ with renewable H₂ to storable chemical fuel CH₄ is called power to gas (PtG) technology and it has received great attention due to several advantages. CO₂ methanation over Ni catalyst is called Sabatier reaction which is well-known since 20th century, but many aspects concerning the catalysts are still under debatable. Here the effect of Ni particle size, metal dispersion and the metal-oxide support interaction of Ni-YSZ catalysts on CO₂ methanation are discussed with the support of complimentary synchrotron and laboratory-based techniques.

Dry reforming of methane (DRM) with CO₂ offers valuable environmental benefits such as biogas utilization, removal of GHG and production of syn-gas with ratio of 1 (H₂/CO₂=1) which is suitable for the synthesis of oxygenated chemicals such as methanol, dimethyl ether (DME) and hydrocarbons by Fischer-Tropsch synthesis. To develop highly stable Ni based catalysts, Co was added with various molar concentration (0-100%) to Ni/CeO₂ catalysts. The reducibility, Ni-Co alloy formation, carbon formation, stability and reaction kinetics are studied by various techniques and in-situ measurements and are discussed.

