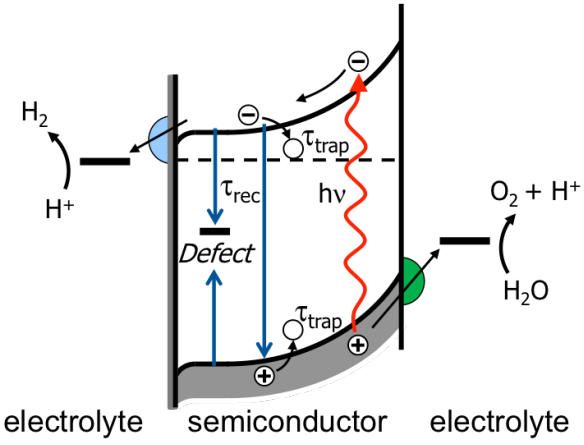
BACHELOR / MASTER RESEARCH PROJECTS

CHARGE CARRIER DYNAMICS IN MATERIALS FOR SOLAR FUELS

SOLAR FUELS

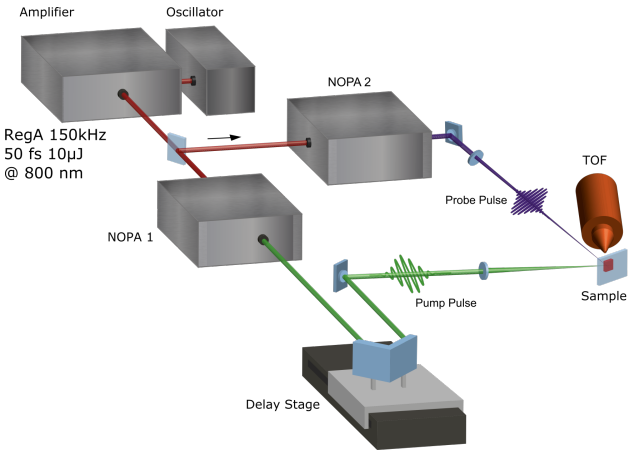
Research at the Institute for Solar Fuels aims toward the efficient and cost-effective direct production of chemical fuels from sunlight. In a solar fuels device the absorption of sunlight in a semiconducting absorber and the catalytic water splitting occur in a photo-electrochemical (PEC) cell. One focus area is to develop a fundamental understanding of the underlaying processes that currently limit the performance of solar fuels devices.



CHARGE CARRIER DYNAMICS

Charge carriers (electron, holes) that are photogenerated in the semiconductor have to reach the interface where they take part in the water splitting reaction. Therefore, low carrier mobility and short lifetime decrease the overal efficiency of solar fuel devices. We employ a variety of state-of-the-art time-resolved laser spectroscopy techniques to study the nature of charge carrier transport and competing recombination processes.

PROJECT OVERVIEW



In this project, you will use advanced time-resolved (femto-microsecond) laser spectroscopy to characterize carrier dynamics in the bulk and near the surface of novel semiconducting metal oxides for solar fuels production. In addition, the influence of surface passivation layers and catalysts will be studied.

RESEARCH AREAS

- Ultrafast laser spectroscopy (e.g. femtosecond-resolved two-photon photoemission spectroscopy (2PPE))
- Transient photoconductivity (e.g. time-resolved microwave conductivity (TRMC), terahertz pump-probe spectroscopy)
- Materials analysis (e.g. XPS, LEED, UV/Vis)
- Materials synthesis (e.g. atomic-layer deposition (ALD))

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TARGET GROUP: Bachelor or Master students in Physics, Chemistry, Materials Science, Renewable Energy or related fields.

LANGUAGE: German/English

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