

## Combined Infrared and X-Ray Analytics of Energy Materials

### General aim

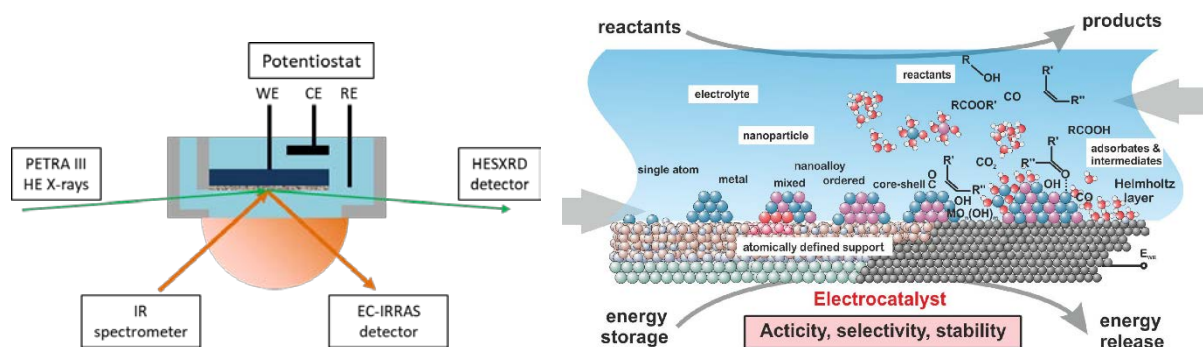
Electrocatalysis plays a crucial role in the transition to a renewable energy system. Most energy storage and conversion technologies for renewables already rely on electrocatalytic processes. Furthermore, with increasing availability of cheap electrical energy from renewables, chemical production will be more and more electrified. New electrocatalysts are required to tackle challenges like electrode stability, dynamics, activity, and selectivity. Although such characteristics are mutually dependent, there is barely any experimental technique that simultaneously provides structural and chemical information on an electrocatalyst in a liquid environment.

### Project description

In this project, DESY NanoLab and the FAU Erlangen are developing a worldwide unique setup to provide insights into electrocatalytic interfaces at a new level of detail. This setup combines two entirely complementary methods in one single experiment, i.e. High Energy Surface X-Ray Diffraction (HE-SXRD) and Electrochemical in-situ Infrared Reflection Absorption Spectroscopy (EC-IRRAS). In this way, the structural and chemical properties of complex, atomically-defined model electrocatalysts can be studied simultaneously.

The PhD project consists of the following steps:

- Setting up and commissioning of the setup for simultaneous HE-SXRD and EC-IRRAS experiments
- Prepare atomically-defined PtNi alloy nanoparticles deposited on a graphene support
- HE-SXRD and EC-IRRAS characterization of PtNi nanoparticles and Pt(111) single crystals in situ/under operando oxygen reduction and isopropanol oxidation conditions
- Complementary CV, STM, XPS, DEMS, and SFC-ICPMS experiments ICPMS to study activities, selectivities, stabilities, and dissolution rates of the model electrocatalysts



### Interested?

Did you recently obtain a M.Sc. degree in a relevant field (e.g. Nanoscience, Physical Chemistry, and Physics) and are you interested to know more about this project? Please contact Dr. Leon Jacobse ([leon.jacobse@desy.de](mailto:leon.jacobse@desy.de)) or Prof. Dr. Andreas Stierle ([andreas.stierle@desy.de](mailto:andreas.stierle@desy.de)).