

Master / Bachelor thesis

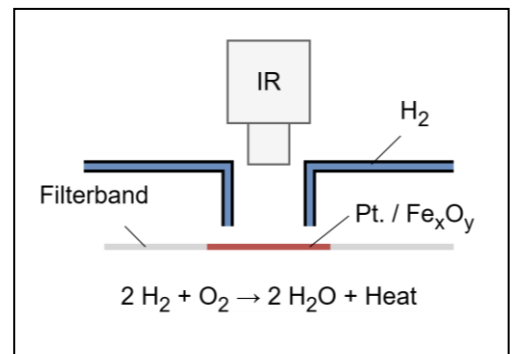
“Design and development of a measurement system for determining the catalytic activity of metal oxide materials on filter tape”

Background and Description

The catalytic activity of materials such as iron oxides or other metal powders plays a central role in energy and environmental technology. One method for evaluating this activity is to measure the temperature change during the exothermic oxidation of hydrogen on the material surface.

In this master's thesis, a measurement system will be developed, constructed, and validated that records the exothermic oxidation of hydrogen on the surface of a catalyst. The material under investigation is present as a powder deposited on a filter tape (upper image). Hydrogen is directed onto the material and oxidized at its surface, releasing heat. The resulting temperature change is measured contactless with an infrared camera and is to serve as an indicator of the catalytic activity (lower image).

Initially, commercial platinum powder will be used as a reference material before the system is later applied to iron oxides and other self-synthesized nanomaterials. In the long term, the measurement system is intended to be integrated into an automated measurement facility in which samples are deposited directly on a filter tape after synthesis and characterized in real time. For the master's thesis, a separate measurement system will first be designed, which can later be integrated into the measurement line



Tasks

- Familiarization with the topic of the hydrogen oxidation reaction (HOR) on catalytic materials
- Development and validation of the setup
- Execution and evaluation of measurements for the characterization of the catalytic activity of nanomaterials

Requirements

- Interest in optics and experimental work
- Basic knowledge of data analysis and programming (e.g., Python, LabVIEW) is an advantage

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