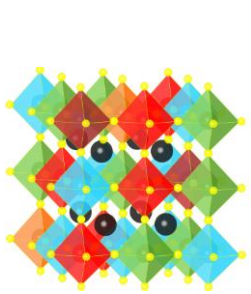
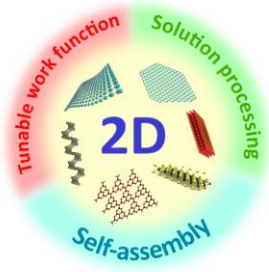
Master Theses

High-Throughput Characterization of Semiconductor Materials by Computer Vision and Hyperspectral Imaging

The research team "Materials Discovery" (part of High-Throughput Materials and Devices (HTMD) group in Helmholtz Institute Erlangen-Nuremberg for Renewable Energies - HIERN) specializes in robot-assisted high-throughput screening of novel materials for energy applications, including:

- **Lead-free halide perovskites and perovskite-inspired materials**
- **Sustainable semiconductor quantum dots**
- **Multi- and single-layer 2D materials**





We offer the opportunity for a **Master's thesis** on a topic related to our general strategy of the development of a self-driving chemical lab for the autonomous discovery of energy materials.

The M.Sc. project will focus on one of the above material classes and one of the specific topics related to the general aim, including:

- **implementation of computer vision algorithms for high-throughput characterization of materials and processes**
- **application of hyperspectral imaging for high-throughput characterization of optoelectronic semiconductor materials**
- **development of machine-learning-based algorithms for analysis of spectral data**

Qualifications:

- Knowledge of chemistry and chemical lab operation
- Basic knowledge of methods of spectral characterization (UV-Vis, PL, vibrational spectroscopy)
- Experience with programming (Python, C#, or platforms like Mathlab) and machine learning
- Ambition, motivation, capability of self-driven work, resistance to challenges

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Publications on the state-of-the-art:

(i) M. Reid et al., Parallel and High Throughput Reaction Monitoring with Computer Vision, ***Angew. Chem. Int. Ed*. 2025, 10.1002/anie.202413395**

(ii) T. Buonassisi, et al., High-throughput micro-scale bandgap mapping for perovskite-inspired materials with complex composition space, **Nature Commun., 2025, 10.1038/s41467-025-62774-y**

Recent publications of the group:

(i) O. Stroyuk, et al., ***Materials Advances***, 2025, 6, 4847.
(ii) O. Stroyuk, et al., ***Nanoscale***, 2025, 17, 16873.
(iii) O. Stroyuk, et al., ***Chem. Commun.***, 2025, 61, 455.
(iv) O. Stroyuk, et al., ***J. Mater. Chem. C***, 2024, 12, 8705.
(v) O. Stroyuk, et al., ***Adv. Func. Mater***., 2024, 2400453.