



2025 Helmholtz – OCPC – Program for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:

Hybrid solar technologies for clean electricity and heating

Helmholtz Centre and/or institute:

Karlsruhe Institute of Technology (KIT), Institute for Microstructure Technology (IMT)

Project leader:

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Description of the project (max. 1 page):

Solar energy is one of the most abundant renewable energy sources, offering immense potential to meet rising global energy demands while reducing carbon emissions. Conventional photovoltaic (PV) panels convert less than 25% of solar energy into electricity, with the remaining energy dissipated as waste heat. This inefficiency limits the effectiveness of solar power generation.

Spectral-splitting hybrid photovoltaic-thermal (PVT) technology presents a transformative solution by utilizing the full solar spectrum to simultaneously generate electricity and thermal energy. This approach has the potential to achieve an overall efficiency of 60-70%, significantly surpassing conventional PV systems. The concept is based on the fact that PV cells operate efficiently only within a specific spectral range. A spectral-splitting system directs only the usable portion of sunlight to the PV cell, while the remaining spectrum—otherwise wasted as heat—is captured by a dedicated thermal absorber for heat generation. This strategy not only enhances energy efficiency but also prevents unnecessary PV heating, improving performance and longevity.

This project will explore spectral- and thermal-management strategies for hybrid solar technologies, aiming to optimize the conversion of sunlight into both clean electricity and usable heat, towards the net-zero future. Key aspects include: (1) Design, construction, and experimental validation of a proof-of-concept prototype. (2) Comprehensive dynamic modelling to simulate and optimize solar collectors under real-world conditions. (3) Integration with other energy technologies. The effort of this project is for carbon-neutrality future.



We encourage candidates with an interest in this research to apply. Prior experience in this specific research area is not required.

Description of existing or sought Chinese collaboration partner institute (max. half page):

This project is open to all Chinese universities and institutions. We look forward to collaborating with Chinese partners who share our goal of advancing this ambitious research project for a sustainable future. There is currently no existing or sought Chinese collaboration partner institute assigned to this project.

Required qualification of the postdoc:

<Sample text below>

- PhD in Engineering Thermophysics, Thermal Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering and Material Engineering.
- Fluent in English speaking and writing.