Technische Hochschule Ingolstadt
Institut für neue Energie-Systeme

Zukunft in Bewegung



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The Institute of new Energy Systems (InES) is one of three institutes for applied research at Technische Hochschule Ingolstadt (THI). It brings together THI's research in solar energy technology, energy system technology and bioenergy technology. Outstanding bachelor's and master's students will find excellent opportunities for development at InES.

Final Thesis (Bachelor or Master)

Spectral Splitting for PVT Collectors in Insulating Glass Design – Feasibility Study and Simulation-Based Performance Assessment

Background:
Photovoltaic-thermal (PVT) collectors generate electricity and heat from the same area. In conventional designs, however, the two uses compete: high fluid temperatures reduce the electrical efficiency of the solar cells. *Spectral splitting* resolves this trade-off by dividing the solar spectrum – the solar cells receive only the wavelength range they can use efficiently, while the remaining part is used thermally. At the same time, insulating glass design has proven to be a cost-effective, highly automated manufacturing route for solar thermal collectors. Combining both approaches into an insulating glass PVT collector has hardly been investigated so far.

Objective:
A feasibility study will identify existing spectral splitting concepts and assess how well they can be transferred to industrial insulating glass collector manufacturing. In addition, an existing Simscape model of an insulating glass PVT collector will be adapted to provide a first estimate of its performance.

Possible tasks:

- Literature review of spectral splitting concepts for PVT (e.g. interference and dichroic filters, liquid filters, luminescent approaches) and of insulating glass manufacturing.
- Assessment of the concepts' transferability to insulating glass manufacturing (e.g. coating processes, integration in the glazing cavity, automation potential, cost, long-term stability).
- Adaptation of an existing Simscape model (e.g. spectral transmittance and reflectance, layer structure) and parameter studies on thermal and electrical performance.
- Derivation of concrete fields of action and open research questions for further development.

Target group:
Students of energy engineering, renewable energy, engineering physics, mechanical engineering or related programmes with an interest in optics and simulation.
Experience with MATLAB/Simulink or Simscape is an advantage.

Start:
Immediately

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