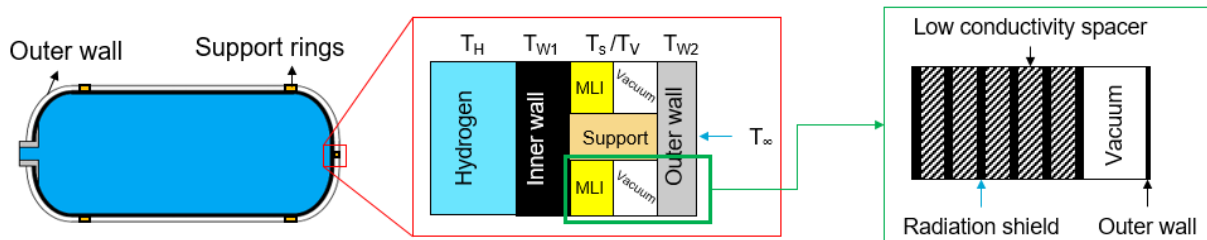


## Studienarbeit



### Topic

Multi-layer insulation design for liquid hydrogen tank

### Technical focus

Heat transfer, thermodynamics

### Contact person

Ivan Komala, IFL Raum 027  
i.komala@tu-braunschweig.de | Tel. 0531 / 391 9918

### Requirements

- Fundamental knowledge in heat transfer and thermodynamics
- Basic knowledge in Matlab/Python and FE software (preferably Abaqus)
- Fluent spoken and written in English

Liquid hydrogen has been emerged as promising alternative carbon-free fuel for aircraft. The extreme cryogenic temperature of liquid hydrogen ( $-253^{\circ}\text{C}$ ) presents significant thermal management difficulties, requiring detailed insulation solutions to minimize boil-off, ensure operational efficiency, and maintain storage structural integrity. Current insulation technologies face persistent challenges in balancing thermal performance with weight considerations and practical implementation constraints. Multi-layer insulation (MLI) is one of the most effective and lightweight structure to reduce the interlayer heat leakage.

The objective is to evaluate MLI configurations for composite liquid hydrogen tanks through thermal analysis and modeling. By comparing the performance of various configurations and materials under operating conditions, this research will contribute to the development of more efficient hydrogen storage solutions.

### Tasks:

- Literature review for available insulation methods
- Thermal analysis for a simple cylindrical structure with liquid hydrogen tank operating conditions
- Model verification with analytical analysis
- Weight-to-insulation assessment