

Saranprabhu Mani Kala

Post doctoral researcher

Supervisor: Prof. Luisa F. Cabeza
Research group: GREiA (UDL)

Research topic and interests

My research focuses on the development, characterization and experimental validation of thermal energy storage materials and systems for efficient and sustainable heat management, with particular emphasis on latent and high-temperature thermal storage.

Thermal energy storage materials

Characterization

Components

Systems

Research interests

Key areas of expertise

- 01 Materials**
PCMs • alloys • salts • composites
- 02 Characterization**
Thermal properties • structure • stability
- 03 Durability**
Thermal cycling • degradation • compatibility
- 04 Components**
PCM modules • Heat transfer enhancers
- 05 Systems**
TES tanks design • validation • life cycle analysis

Current work

TES materials

Investigation of metal-alloy PCMs, molten salts, and composite storage materials focusing on improving the thermophysical properties for enhanced charging and discharging performance.

Experimental setup design

Development of low-temperature (20 °C to 75 °C) and high-temperature (900 °C) setups for studying the charging and discharging characteristics of the TES tanks.

Thermal cycling and compatibility

Investigation of thermal cycling stability of sensible storage materials from 300 °C to 700 °C and compatibility of metal alloy PCMs with stainless steel containers.

Life cycle assessment

Life cycle assessment and sustainability evaluation of thermal energy storage technologies, including environmental impacts, circularity and social sustainability.

Relevant funded projects

ISSDEMO - Research on high-temperature TES and metal-alloy PCM technologies for industrial heat/steam applications.

HYBRIDplus - Effective thermal conductivity measurement of anisotropic metal wool-loaded PCM matrix.

SUSHEAT - Development of a Bio-Inspired TES Tank for Heat Transfer Enhancement in Latent Heat Thermal Energy Storage Systems

AGRI-COOL - Performing Life Cycle Assessment (LCA) to evaluate the environmental sustainability of an off-grid, PV-PCM thermal energy storage-based cooling system for food preservation in Africa

A maximum enhancement of 649% occurred in copper metal wool-loaded n-octadecane matrix samples along the metal wool fibres' direction.

The bio-inspired TES tank had a higher discharge rate and needed 52% less time to release stored heat.



ACKNOWLEDGEMENTS

This project was funded by the European Union's Horizon Europe Research and Innovation Programme under grant agreement 101084182 (HYBRIDplus). This project was funded by the European's Horizon research and innovation programme under grant agreement 101147102 (AGRI-COOL). This project has received funding from the European Union's Horizon research and innovation programme under grant agreement 101103552 (SUSHEAT). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them. The Clean Energy Transition Partnership is a transnational joint programming initiative to boost and accelerate the energy transition, building upon regional and national RDI funding programmes. The initiative is receiving funding from the European Union's research and innovation programme "Horizon Europe" under grant agreement No 101069750. The author Luisa F. Cabeza is a Serra Hünter Fellow, ascribed to the Serra Hünter Programme, programme funded by the Government of Catalunya. This study receives funding from the Ministerio de Ciencia e Innovación - Agencia Estatal de Investigación (MCIN/AEI/10.13039/501100011033) through the PCI2023-145964-2 project and the European Union "NextGenerationEU"/PRTR". This work was also partially funded by Ministerio de Ciencia, Innovación y Universidades - Agencia Estatal de Investigación (AEI) (RED2024-153629-T). This work is partially supported by ICREA under the ICREA Academia programme. The authors would like to thank the Departament de Recerca i Universitats of the Catalan Government for the quality accreditation given to their research group (2021 SGR 01615). GREiA is certified agent TECNIO in the category of technology developers from the Government of Catalonia.