SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2025 HIGHLIGHTS

Task 75 *Thermal Energy Storage Materials* started

ABOUT TASK 75

Thermal energy storage (TES) is subdivided into sensible, latent, and thermochemical heat & cold storage. A variety of different TES materials is investigated and applied in TES systems. New materials, material mixtures, and composites are worked on and presented by a growing community of experts.

In Task 75, research and development on TES materials for latent heat storage (phase change materials, PCM), for thermochemical heat storage (thermochemical materials, TCM), and sensible heat storage materials are in focus.

Task 75 is connected to Task 48 of the Energy Storage TCP (ES TCP). Task update reports and presentations are given to both ES and SHC ExCo.

To Task 75 has shared expert meetings with Task 74 *Components for thermal energy storage*. For the application-oriented development and evaluation of thermal energy storage materials, it is important that materials scientists and developers of storage components and systems work closely together.

SCOPE AND GOALS

Task 75 covers research and development activities on thermal energy storage materials:

- Phase Change Materials (PCM)
- Thermochemical Materials (TCM) including sorption and chemical reactions
- Sensible heat storage materials (except water)

TES materials – PCM crystal under the microscope (left), zeolite beads (centre), rocks (right)

Participating Countries:

Austria
Canada
China
Denmark
Finland
France
Germany
Italy
Netherlands
Poland
Portugal
Slovenia
Spain
Sweden
Switzerland
Turkey
United Kingdom
USA

Task Period: September 2025 — August 2028
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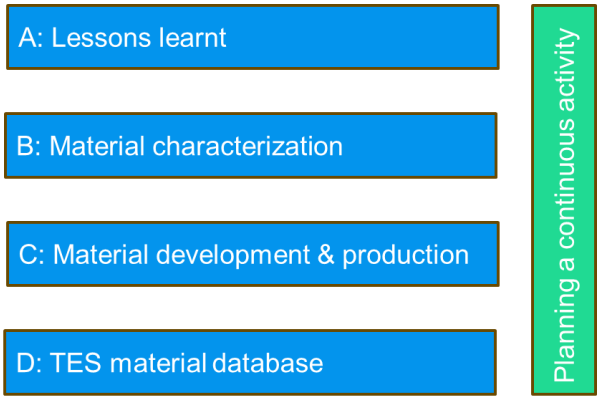
The main goal of the proposed Task is to support TES materials R&D by

- developing measurement guidelines for material properties,
- providing an overview of new and innovative PCM and TCM as well as related synthesis and production methods,
- establishing a high-quality TES materials database, and
- disseminating lessons learnt from previous Tasks on compact TES.

An additional goal is to elaborate a plan for a permanent activity which allows a continuation of, first, the strong collaboration among the material scientists, second, the development of measurement guidelines through round robin tests, and, third, the maintenance and expansion of the materials database.

SUBTASKS

The work is structured in four Subtasks and a side activity.



Task 75 structure with four Subtasks A to D and the planning of continuous activity

Subtask A: Lessons learnt, Subtask lead: Frédéric Kuznik, INSA Lyon, France

Subtask A has the objective to communicate the lessons learnt from previous Tasks, previous research, and the current Task 75 on TES materials. For the bi-annual Task expert meetings, lessons learnt will be selected and discussed. The way of communication depends on the type of lesson learnt and the targeted audience (e.g. academia, policy makers dealing with energy transition issues like funding of research; journalists and media people who need an explanation of the role and possibilities of compact thermal energy storage, or less-scientific people with little previous technical knowledge).

Subtask B: Material characterization, Subtask Lead: Daniel Lager, AIT, Austria

Subtask B will be a continuation of the development of measurement guidelines or application of existing standards for (thermophysical) properties through round robin tests. Several round robin tests and measurement guidelines were worked on in previous Tasks, e.g. enthalpy of PCM, specific heat capacity, viscosity, thermal conductivity.

Subtask C: Material development and production, Subtask Lead: Saman N. Gunasekara, KTH, Sweden

In Subtask C, TES material development and production will be addressed. Material development includes the identification of new materials and the modification of materials, whereas material production includes

synthesis and upscaling methods. Both material development and production are the basis for a tailored selection of TES materials for TES systems.

Subtask D: TES material database, Subtask Lead: Alenka Ristić, NIC, Slovenia

In Subtask D, the TES materials database that was initiated in previous Tasks will be restarted. As a second activity, and because it is connected to the website of the materials database, the PCM Wiki will be extended to a TES materials Wiki. Some of the lessons learnt covered in Subtask A can be taken up in the new Wiki.

Planning a continuous activity, Lead: Christoph Rathgeber, ZAE Bayern, Germany

Several TES materials topics have been part of Tasks on compact TES for many years and are expected to be still of importance in the future. To have a more continuous workflow for these topics, the Task experts will elaborate a plan how to organize such a permanent activity that is not structured like a standard three-years Task.

HIGHLIGHTS OF THE KICKOFF MEETING

Task 75 started with the kick-off meeting in Stockholm, Sweden, from 13 to 15 October 2025. The meeting was organized by KTH. It was a hybrid meeting attended by 33 experts on site and 28participants online. This and all future experts meetings will be shared meetings together with Task 74.

Task 75 Kickoff meeting (together with Task 74) at KTH in Stockholm, Sweden

Four companies – three PCM and one ice storage manufacturers – attended the meeting, three of them presented their portfolio and their TES materials R&D related activities:

- Rubitherm Technologies GmbH, Germany
- Pluss Advanced Technologies Pvt. Ltd, Netherlands
- Iceheart AB, Sweden

In addition, several universities and research institutes presented their work related to the scope of Task 75:

- TU Vienna on recent progress in TCM material synthesis
- Univ. of Lleida on metal alloys and bio-based PCM
- Silesian Univ. on ionic liquids and deep eutectic solvents
- Univ. Twente on particle kinetics and property characterization (TCM)
- TU Eindhoven on visualizing the structure of PCM using NMR

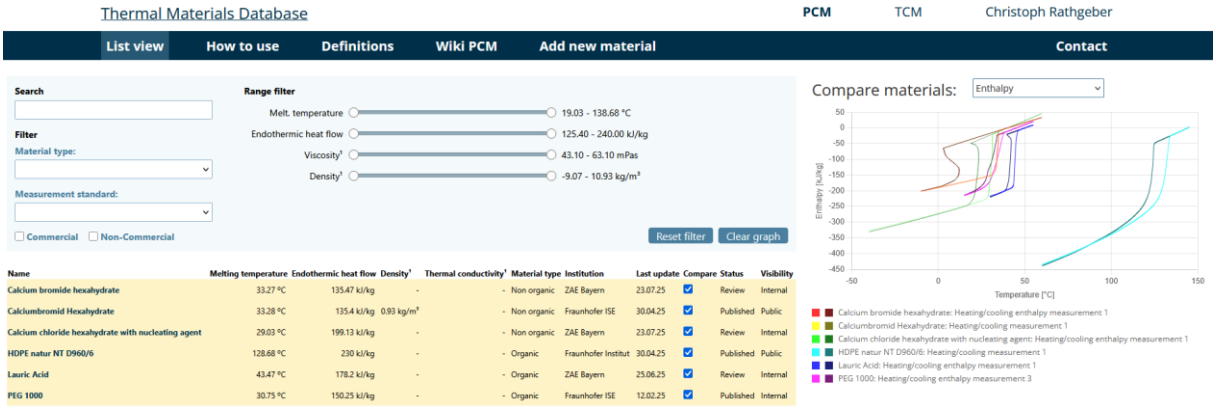
- SPF on “heat of solution” PCM
- Aarhus Univ. on ionic liquids for TES
- Aalto Univ. on bio-inspired composite materials for sorption TES

In **Subtask B *Material characterization***, several round robin tests with coordinators have been identified by the end of 2025:

- Thermal Diffusivity/Conductiviy PCM" – Coordinator: Pluss Advanced Technologies Pvt. Ltd.; Nidhi Agrawal
- TCM solid density – Coordinator: National Institute of Chemistry Slovenia - Alenka Ristić
- Degradation via TGA – Coordinator: University of Birmingham - Helena Navarro
- Specific Heat Capacity Hydrates – Coordinator: TU Eindhoven - Claudiu Savulescu
- Specific Heat Capacity High temperature – Coordinator: DTU - Ming Chen
- Viscosity measurements PCM – Coordinator: Tekniker - Nerea Uranga
- Thermal conductivity at high temperature – Coordinator: Univ. of Lleida - Saranprabhu Mani Kala

The Subtask B leader will support the coordinators and give a detailed description to the coordinators and participants how to evaluate measurement uncertainties of their evaluated quantities.

In **Subtask D *TES materials database & Wiki***, during the Kick off meeting, Fabrizia Giordano from AIT (Austria) presented how to use the PCM section of the database, following the guidelines in the database “How to use” section and offered suggestions to improve its visibility.



Screenshot of the TES Materials Database (internal view as of November 2025)

The discussion focused on encouraging Task members to upload PCM and TCM data. The database management structure was also outlined, comprising three database managers, five reviewers of the entered data, and ten Task member contributors uploading data from research institutes, universities, and industry. Among the Task members, eight participants will contribute PCM data, and three will contribute TCM data.

The suggestions for increasing the visibility of the database after its launch include, first, to identify the target groups, second, to contact stakeholders, and third, to exchange/connect with other material databases. Next year, the database will be moved to the Fraunhofer ISE server and made available to Task 75 members for uploading measurements. Once sufficient data have been uploaded and reviewed, the database managers will decide on opening the database to other contributors outside the Task. Online meetings will be held twice per year to discuss the progress of the database. A newsletter will be sent to database users to provide updates on new content and activities, including newly added measurements and recently published papers or reports that include database measurements.