Teilnahme und Mitarbeit an der Task Definition Phase und Startphase des Joint IEA-SHC Task 42 "ADVANCED MATERIALS FOR COMPACT THERMAL ENERGY STORAGE"

Projekt 819418, 828104

FFG IEA FORSCHUNGS KOOPERATION bmvit

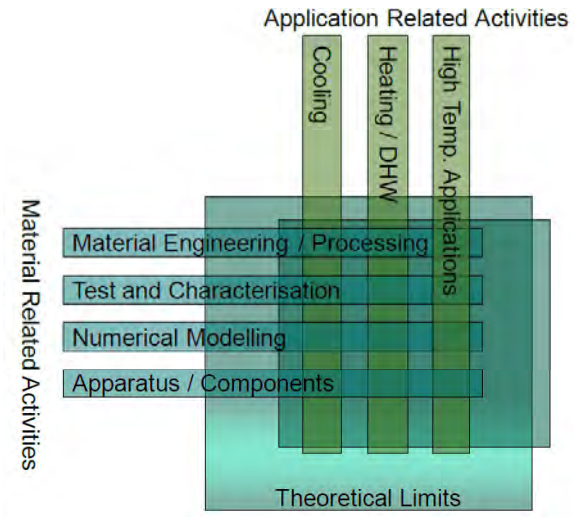
Projektleitung
Universität Innsbruck, Prof. Wolfgang Streicher

Projektpartner

TU Graz Institut für Wärmetechnik AEE INTEC AIT AUSTRIAN INSTITUTE OF TECHNOLOGY TOMORROW TODAY ASiC

Operating Agents:
IEA SHC: ECN, Niederlande, Wim van Helden (vanhelden@ecn.nl) und
ECES: ZAE Bayern, Deutschland, Andreas Hauer (hauer@muc.zae-bayern.de).

Country	Organisation	Responsible	Funding status	IA	Person-months Project	Task
AT	IWT/AEE/Arsenal	Wolfgang Streicher	funded	SHC	24	6
AT	ASIC	Bernhard Zettl	funding applied for			
AU	University of South Australia	Frank Bruno	funding applied for	SHC		
BE	VITO	Johan van Bael	funding applied for	ECES		
CH	EMPA	Robert Weber	funded until 2010	SHC	12	2
CH	SPF	Elimar Frank	funding applied for	SHC		
DE	Univ. Erlangen	Jimmy Ofili	funding applied for	ECES		
DE	Fraunhofer ISE	Peter Schossig	funded	ECES		
DE	Fraunhofer UMSICHT	Clemens Pollerberg	no funding	ECES		
DE	ITW Stuttgart	Henner Kerskes	funded	ECES	100	6
DE	University of Kassel	Roland Heinzen	funded	ECES	48	4
DE	University of Magdeburg	Franziska Scheffler	funding applied for			
DE	Univ. Luneburg	Oliver Opel	funding applied for	ECES		
DE	Vaillant	Max Bankowski	funded	ECES		
DE	ZAE Bayern	Andreas Hauer	funded	ECES	24	12
DK	DTU	Simon Furbo	funded	SHC	15,6	
ES	Abengoa Solar	Cristina Prieto	funding applied for	SHC		
ES	CIEMAT	Rocio Bayon	funded	SHC	56	
ES	Inasmet	Patricio Aguirre	funding applied for	SHC		
ES	Tekniker	Miren Blanco	funded	SHC		
ES	University of Lleida	Lluisa Cabeza	funded	ECES		
ES	University of Zaragoza	Ana Lázaro	funded	SHC	19,7	1,15
FI	VTT	Lisa Wikstrom	funding not sure	SHC		
FR	CSTB	Peter Riederer	funding applied for			
FR	EDF	Philippe Stevens	funded		48	8
FR	INES	Philippe Papillon	funded			
FR	Université de Bordeaux	Elena Palomo	funded			
FR	Université de Lyon	Frédéric Kuznik	funded			
FR	Université de Savoie	Lingai Luo	funded		40	2
NL	Capzo	Herman Reezigt	funding not sure	SHC		
NL	ECN	Martijn van Essen	funded	SHC	48	24
NL	Eindhoven Univ. of Technology	Camilo Rindt	funded	SHC	52	
SE	Ecostorage/KTH	Viktoria Martin	funded	ECES	48	8
SI	National Institute of Chemistry	Venceslav Kaucic	funding applied for			
TR	Cukurova University	Halime Paksoy	funding applied for	ECES		
UK	BASF	Kishor Mistry	funded		16	
UK	University of Loughborough	Philip Eames	funding applied for			
UK	University of Warwick	Chang-Ying Zhao	funded		100	
US	Oak Ridge National Laboratory	Jan Kosny	funded	SHC		
US	University of Minnesota	Jane Davidson	funded	SHC		
			Total		651,3	73,15



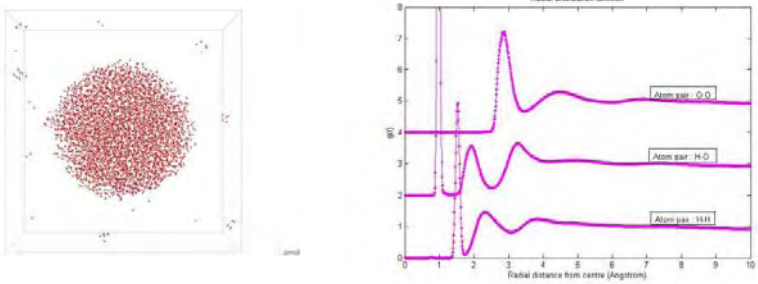
Materials:	**WG Leader**
Material Engineering / Processing	Elena Palomo (Univ.Bordeaux)
Test and Characterization	Stefan Gschwander (ISE)
Numerical Modelling	Camilo Rindt (TUE)
Apparatus and Components	Wim van Helden (ECN)
Applications:	
Cooling (0 °C – 20 °C)	Motoi Yamaha (Chubu Univ.)
Heating / DHW (20 °C – 100°C)	Jane Davidson (Univ.Minnesota)
High Temp.Appl. (> 100 °C)	Luisa Cabeza (Univ.Lleida)
Cross Cutting:	
Theoretical Limits	Eva Günther (ZAE)

#	Deliverable	Due date	Ready date	Comments
A1.1	Material database: a) PCM materials; and b) sorption materials; and c)	feb-11		
A1.2	Samples of new materials for material testing	jan-11		
A1.3	~~Material safety data sheets~~	jan-12		included in material database
A1.4	Inventory of production technologies	jan-11		
A1.5	Material price data sheets	jan-12		
	State of the art report on liquid SEN			newly defined
	State of the art report on solid SEN			newly defined
	State of the art on Encaps. Inorganic PCM			newly defined
	State of the art on solid-solid PCM			newly defined
	State of the art on Composites			newly defined
A2.1	List of existing standards	mrt-10		
A2.2	Definition of draft standard for Round Robin Test (RRT)	jul-10		
A2.3	RRT results and final standard	jan-12		
A2.4	Database	jun-12		
A3.1	Report on state-of-the-art modeling techniques of TCM/PCM-materials on micro-, meso- and macro scales	jan-10		concept ready in Oct 2010
A3.2	Collection of experimental data on the behavior of TCM/PCM-materials which can be used to bench-mark numerical codes	jul-10		
A3.3	Progress report on the (validated) numerical models developed for the micro-, meso-, macro and multi-scale	jul-11		
A3.4	Overview of material properties required for increased storage performance compared to conventional storage techniques	jan-13		
A3.5	Final report on the (validated) numerical models developed for the micro-, meso-, macro and multi-scale	jan-13		
A4.1	Repository of reactor designs	jul-10		
A4.2	Storage apparatus performance test protocols	jan-12		
A4.3	Long-term apparatus durability test protocols	jan-12		

#	Deliverable	Due date	Ready date	Comments
B1.1	Boundary conditions Report based on Annex 14 final report	jan-10		
B1.2	Case studies for several applications	jul-10		
B1.3	Definition of typical application	jan-11		
B1.4	Performance Analysis for each application	jul-11		
B1.5	Upper performance limit estimation for each application	jan-12		
B1.6	Thermo-Chemical boundary condition information of each application	jan-13		
B1.7	Life-cycle cost analysis for several applications	jan-13		
B2.1	Boundary conditions and requirements for each application	jul-10		
B2.2	Case studies for several applications	jan-11		
B2.3	Techno-economical potential for each application	jan-12		
B2.4	Numerical system model for each application	jan-12		
B2.5	Upper performance limit estimation for each application	jul-12		
B2.6	Lab-scale tests of several applications	jan-13		
B2.7	~~Field test of at least one application~~	jan-13		striked at EM4 Graz.
B2.8	Life-cycle cost analysis for several applications	jan-13		
B3.1	Three case studies			
B3.1.1	Problem definition	mrt-10		
B3.1.2	Technical solution	okt-10		
B3.1.3	Techno-economical potential	jul-11		
B3.2	Numerical system model. Application of process heat at 200 C	jul-12		
B3.3	Lab.scale Application of process heat at 200 C	jul-12		
B3.4	Field test. Application for solar power plant	jul-12		
B3.5	Final report	jan-13		
C1.1	Physical limits of thermal energy storage density as a function of	okt-10		
C1.2	Technical limits and constraints	aug-11		
C1.3	Economical limits and constraints	feb-12		

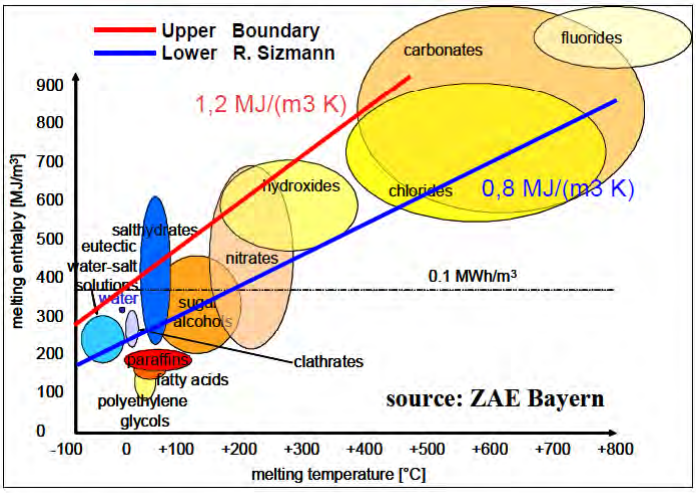
Research on Molecular scale

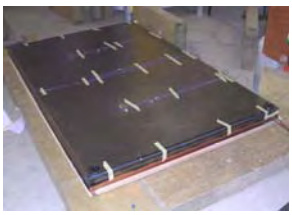
Eindhoven University of Technology



Condensation of water at 298 K: 4096 molecules, box size 103X103X103 Ängstrom, periodic boundaries, initial random distribution, total time 0.05 ns. Left: the end distribution of the water molecules. Right: the radial distribution functions.

Theoretical Limits

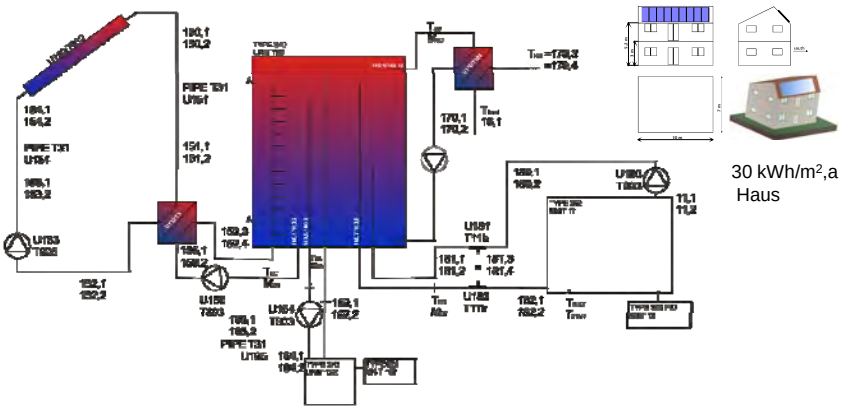




DTU Dänemark, Saisonspeicher
mit PCM und Unterkühlung

Gebäudeintegration von PCM
Lleida, Spanien

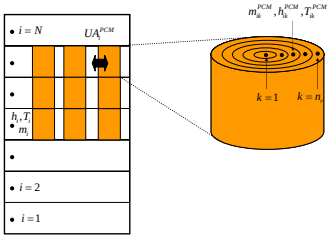
Reference system (Task 32) (IWT, TU Graz)

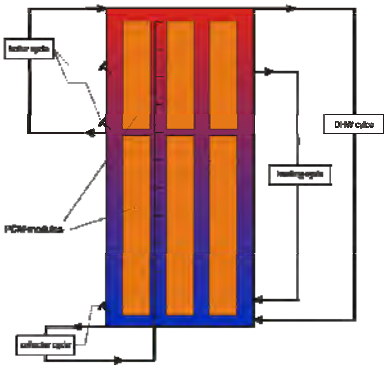


30 kWh/m²,a
Haus

Storage tank: configuration with PCM modules model (Heinz, Schranzhofer IWT TU Graz)

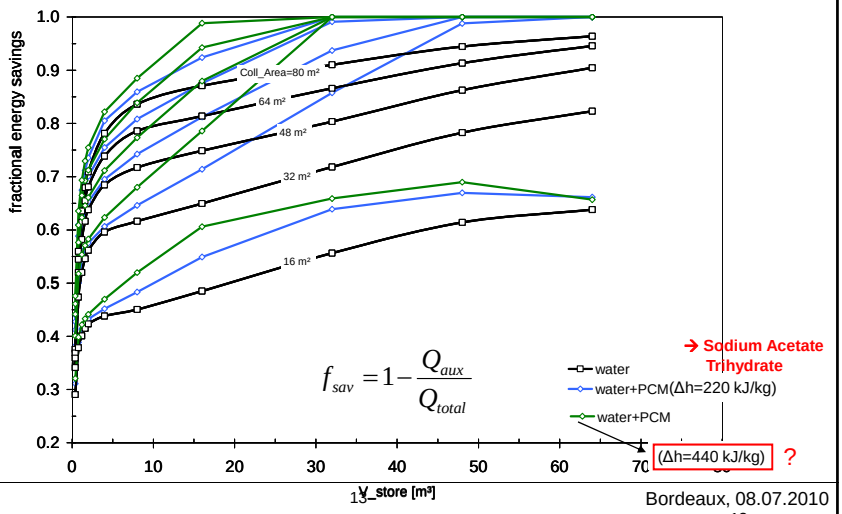
- Cylindrical PCM modules
- Module diameter 75 mm
- PCM volume fraction 50%
- Conduction in radial direction not considered





Results: solar fraction (Heinz, IWT TU Graz)

50 % PCM, T_m=58 °C



Austrian Project: Masterplan TES

- **Titel: „Austrian Masterplan Thermal Energy Storage“**

The Masterplan should enable:

- **straight forward development** of thermal storage technology
- efficient **funding and evaluation** of research projects
- **coordination** of research activities in the field of thermal energy storage in Austria
- evaluations of **environmental benefits** due to storage applications
- connection to **international** research activities
- taking into account thermal energy storage in strategy of **renewable energy** and **environmental policy** agendas

Basic-Document

Idea: Describe principles and limitations for expertes and others, investigation on research projects and products, literature survey

Sensible heat storage	PCM-storage	Sorption heat storage	Thermo-chemical heat storage