



Catch, transport & release heat

Versatile, polysaccharide-based composite material for water & heat storage

FOCUS SECTORS

- ▶ Industrial & residential heat storage
- ▶ Energy sector
- ▶ Industrial & residential water harvesting & purification

PROJECT KEY WORDS

- ▶ Polysaccharide & salt polymer
- ▶ Water & heat storage
- ▶ Flexible material synthesis & structuring
- ▶ Inexpensive feed stock
- ▶ Toxicologically non-hazardous

DEVELOPMENT STATUS

- ▶ Heat storage properties experimentally proven
- ▶ Laboratory tests in reactor

PATENT PROCEDURE STATUS

- ▶ German patent application filed

POTENTIAL FOR COOPERATION

- ▶ R&D Cooperation
- ▶ Transfer of rights
- ▶ Licensing

Background & Innovation

Energy storage, particularly heat, is a major issue in the sustainable energy landscape. Many Industrial processes, as well as private applications, demand important optimization steps in order to minimize energy waste.

A number of materials are currently used as storage medium, including water, zeolites or phase-change materials (PCM). Due to the increasing demand for higher capacity, these solutions show some limitations in terms of performance.

We are introducing a new hydrogel-derived composite material for thermochemical heat storage and fresh water extraction from air. Our innovative material reversibly absorbs and releases heat through a chemical reaction: hydration/dehydration of salts, suggesting a robust alternative to current solutions.

Competitive advantage

Our material can be used in numerous processes that require heat storage over flexible periods of time. Industrial and residential cooling and heating processes, optimization of energy consumption and drinking water production and purification are some relevant uses for this material.

An excellent performance is ensured by relevant features, which have been experimentally tested.

- ▶ Simple, robust & flexible synthesis
- ▶ Inexpensive feed stock
- ▶ No energy-demanding synthesis steps
- ▶ High water & heat storage density
- ▶ Adaptability to numerous applications
- ▶ High cycle stability
- ▶ Toxicologically non-hazardous

Technical Description

This innovative composite polymer for thermochemical heat storage is based on a polysaccharide matrix embedding absorbing salt particles.

A versatile synthesis route allows creating a material with different thermochemically active salts. Particle size can be adapted, to adjust the hydration/dehydration kinetics. This facilitates full adaptability of the material to different applications. The particles can be obtained in spherical beads of 1-5 mm in diameter, making it ideal for a packed bed application.

A very efficient water exchange is achieved through a highly porous structure that contains up to 90 wt.-% of absorbing material.

Based on a chemical reaction, the heat storage capacity is manifold higher than that of zeolites or PCM, achieving, at the current development status, $>1,2 \text{ GJ/m}^3$. The material can be charged with heat at temperatures between 100 and 200°C.

Depending on the reaction conditions it is possible to absorb up to 0.9 g of water per gram of composite.



Final composite material with beads in the size of 2 mm. Different salts can be incorporated depending on the required application conditions.