

# Cement, salt and water: A new storage material for green heat

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Heating the space where we live or work is a common necessity in most

inhabited areas. The energy required for this process is responsible for a third of all the energy consumed in Europe; moreover, 75% of this energy is produced with fossil fuels.

The idea of a new material for thermochemical energy storage comes from a group of researchers of the Applied Science and Technology (DISAT) and Energy (DENERG) departments of the Polytechnic University of Turin, and from the Advanced Energy Technology Institute of the Italian National Research Center (CNR-ITAE). The paper was published on the journal *Scientific Reports*.

In this study, the researchers demonstrated how it is possible to produce heat by the hydration of salt present inside the pores of cement.

In order to reach sustainability goals in Europe, it is necessary to reduce the use of fossil fuels and to use instead renewable energy-based systems. However, the integration of renewable energy in heating systems entails a time gap between the energy surplus and the daily and annual peaks of demand.

Solar energy, for instance, is widely available in summer months, however most heating requirements occur during the winter, when at our latitudes, the day is much shorter. It is evident that the widespread exploitation of [renewable energy](#) sources must integrate with the development of low cost storage systems, with the goal to balance the time shift between the demand and the availability of energy. One of the possible ways to store energy is the thermochemical approach, that allows for heat storage for a virtually infinite time, contrary to the standard approaches.

"Try to dissolve a good amount of salt in a glass of water, what you will notice is that the glass heats up with some salts and cools down with others. A similar phenomenon is at the basis of our materials, with the

difference that instead of liquid water we use aqueous vapor, without dissolving the salt. The aqueous vapor interacts with the salt and produces heat. Once completely hydrated, it will be possible to revert the salt to the initial state by a simple drying process, which allows for the elimination of the surplus water.

This kind of reaction is well known, and many thermal storage materials have already been developed; however, their cost is most often the limiting factor. For instance, zeolite is one of the best materials from a thermal point of view, but it can cost up to several tens of euros per kilogram. This is unbearable cost when storing the energy needed to heat a room or a whole building. Cement, used as a matrix to host salt hydrates, is a very interesting material since it is well known, easily available and cheap," explains Luca Lavagna, a post-doc researcher of the Applied Science and Technology Department of Polytechnic of Turin and first author of the paper.

The innovative feature presented by the researchers here is the use of cement as a host matrix for the [salt](#). The total cost of the materials is very low and energetic behavior is good: the energy cost, measured in stored €/kWh, is lower than most current materials used widely. This new material, moreover, shows an extraordinary stability even after hundreds of heating/cooling cycles. This work can represent the first step toward the creation of a new class of composite materials for thermochemical [energy](#) storage,

**More information:** Luca Lavagna et al, Cementitious composite materials for thermal energy storage applications: a preliminary characterization and theoretical analysis, *Scientific Reports* (2020). [DOI: 10.1038/s41598-020-69502-0](https://doi.org/10.1038/s41598-020-69502-0)

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