Promising salt batteries for heat storage

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Salt batteries can store summer heat to be used in winter, but which salt works best for the purpose? On 19 December, Lian Blijlevens will defend her Ph.D. thesis on her research into salt for heat storage at Radboud University.

Although a growing number of roofs sport solar panels, these panels only convert light from the sun into electricity. The solar panels themselves are also heated by the sun, but this heat is now being lost. Blijlevens states, "The heat can be extracted by a solar boiler and used to heat your house or shower. However, in summer you always generate more solar heat than you use, and in winter you have less. So what we need is a way to preserve that heat."

Salt battery

Storing the summer heat for use in winter is a challenge, however. And the solution might take an unexpected form: salt. Not the salt you sprinkle over your egg, but another type of salt, such as strontium chloride.

"A salt battery contains salt hydrates, which are salts with water in the crystals. The battery recharges by heating the salt, which causes the water to go out of the crystals. When you need the heat, you add water vapor to the crystals and the heat is released again," says Blijlevens. This was already known, but what was not yet known is which salts are really suitable for use in homes.

Blijlevens and her colleagues from Eindhoven University of Technology assessed hundreds of salts on availability, safety, and compactness. The dozen or so salts that made it through the initial assessment were then tested in the lab for recyclability. Blijlevens states, "You don't want to have to replace the salt every year."

Heated scales

Blijlevens tested the salts using thermal analysis: the salt was placed on heated scales and the temperature was increased. "You can see the

weight of the salt change, which shows that the water is evaporating out of it. If you then add water vapor again at a lower temperature, you can see how much water is being absorbed."

Strontium chloride turned out to be a promising candidate in this respect: it is not too expensive, heats up well, and remains stable without side effects. "Potassium carbonate, which is also used in salt batteries, is cheaper, but that salt also reacts to CO_2. This makes the battery less effective in the long run," says Blijlevens. The search for the best salt continues.

But the future looks promising for salt batteries, Blijlevens believes. "If you want to heat a house this way, you need about 10 m^3 of material, which corresponds to two to three wardrobes. You no longer need natural gas and you can use the heat you store in summer in winter. It's a great solution to a major problem."

Provided by Radboud University

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