Boosting thermal energy storage with polyelectrolytes

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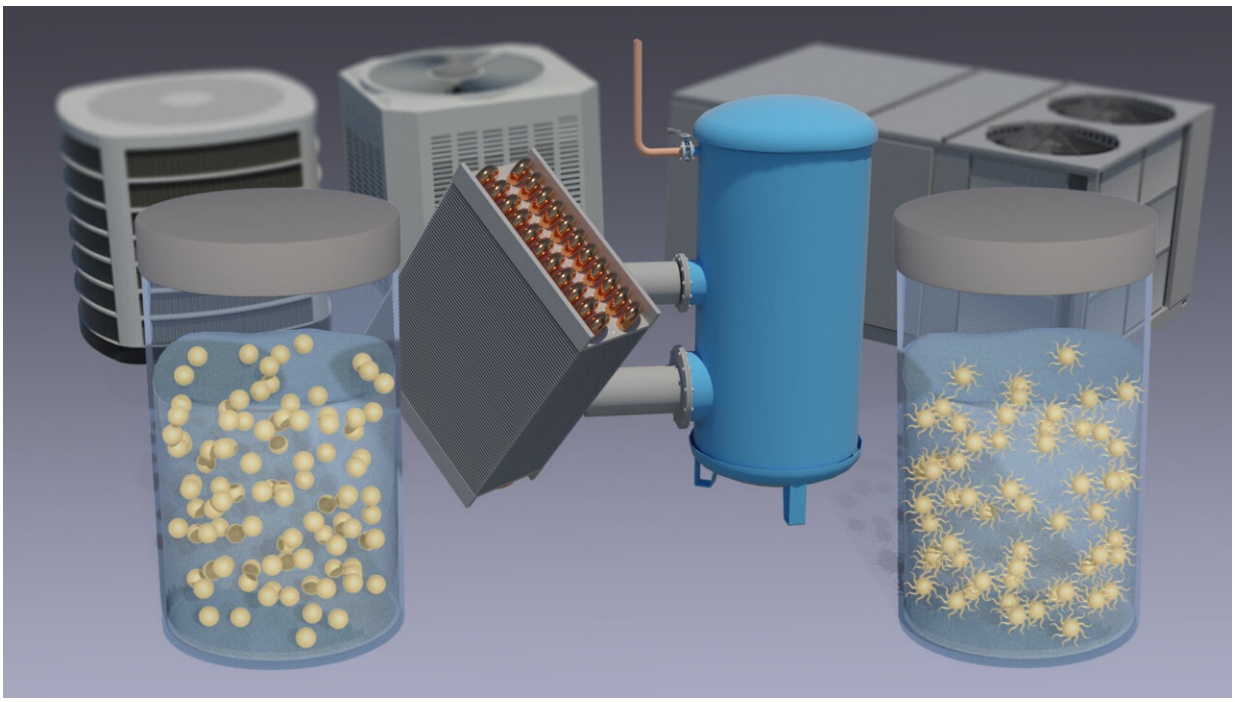

ORNL researchers found that a polyelectrolyte additive can improve the stability and performance of a salt hydrate PCM, enhancing the potential for use in heat pumps. Credit: ORNL, U.S. Dept. of Energy

Oak Ridge National Laboratory researchers have demonstrated that an additive made from polymers and electrolytes improves the thermal performance and stability of salt hydrate phase change materials, or PCMs, a finding that could advance their integration into carbon-

reducing heat pumps.

PCMs absorb and release energy when changing between solid and liquid forms, making them suitable for heating and cooling applications. They're also prone to phase separation and instability, which limits thermal energy storage capacity.

In an ORNL-led study published in *iScience*, eight different polymer mixtures were added to the PCM. Synthetically made and naturally occurring polymers were tested. Results showed that the polyelectrolyte additive, dextran sulfate sodium, can achieve the best performance.

"The pure salt hydrate PCM cannot sustain up to 10 melt-freeze cycles, but with the additive, stability is retained after 150 cycles," ORNL's Damilola Akamo said. "This determination will help inform the design of thermal storage materials in low-carbon-emitting heat pumps for residential and commercial buildings."

More information: Damilola O. Akamo et al, Stabilization of low-cost phase change materials for thermal energy storage applications, *iScience* (2023). DOI: 10.1016/j.isci.2023.107175

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