Development of a new LiBr/LiOH-based alloy for thermal energy storage

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Abstract

In this study, the LiBr/LiOH phase diagram and the key related thermodynamic properties of its specific compounds were theoretically and experimentally estimated (by thermodynamic modeling and differential scanning calorimetry experiments, respectively) and compared with previously reported results. The peritectic compound Li₄Br(OH)₃ was identified as a highly promising candidate for heat storage applications at around 300°C, mainly because of its outstanding energy density. As a precaution, the two limiting cases of thermodynamic solidification simulations (equilibrium and Scheil–Gulliver cooling conditions) were considered to confirm the relevance of synthesizing and experimentally studying this new potential heat storage material. After many tests and adjustments, a suitable synthesis protocol was developed and validated for characterizing the Li₄Br(OH)₃ compound using the X-ray powder diffraction technique. Preliminary thermal analysis was also performed for the successfully synthesized peritectic compound to confirm its high potential as a heat storage material. Our results indicate that it would be useful to comprehensive analyze the thermophysical properties of this material to assess its capacity for utilization in thermal energy storage applications.