

Durability Enhancement of CaSO₄ in Repetitive Operation of Chemical Heat Pump

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Abstract : An important problem for the CaSO₄/CaSO₄·1/2H₂O Chemical heat pump (CHP) is that the material is deactivated through repetitive reaction between hydration and dehydration in which the crystal phase of the material is transformed from III-CaSO₄ to II-CaSO₄. We investigated suppression on the phase change by adding a sulfated compound. The most effective material was MgSO₄. MgSO₄ doping increased the durability of CaSO₄ in the actual CHP repetitive cycle of hydration/dehydration to 3.6 times that of undoped CaSO₄. The MgSO₄-doped CaSO₄ showed a higher phase transition temperature and activation energy for crystal transformation from III-CaSO₄ to II-CaSO₄. MgSO₄ doping decreased the crystal lattice size of CaSO₄·1/2H₂O and II-CaSO₄ to smaller than that of undoped CaSO₄. Modification of the crystal structure is considered to be related to the durability change in CaSO₄ resulting from MgSO₄ doping.

Keywords : CaSO₄, chemical heat pump, durability of chemical heat storage material, heat storage

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