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Mixed Inorganic Hydrate Salts as Sustainable Thermal Energy Storage Technology: Synthesis and Thermal Behavior Investigation

Hanane Ait Ousaleh[1]*, A. EL Bouari[1], A. Zaki[2] and **A. Faik[2]**
[1]University Hassan II of Casablanca, Morocco
[2]CIC Energigune, Spain

Thermochemical energy storage is a qualified indirect storage. In contrast to sensible or latent heat storage, energy is stored through a physico-chemical process that consumes energy during the charging (dehydration) phase and releases it during the discharging (hydration) phase. It is not directly accessible, which has the advantage of not causing significant losses.

Hydrate salts used for thermal energy storage have been always attracting topic within the research community thanks to their good performance on energy conservation applied for energy efficiency in buildings, such applications as solar domestic hot water systems. Thermochemical storage materials (TCMs) should have a high-energy storage density, multiple sources, rational price and relatively good thermal conductivity. This characteristics make of hydrate salts a worthy candidate used for heat storage.

This study is focused on development of new mixed hydrated salts in order to explore new temperature range by means of salts incorporated. For the present work, structural and thermal investigations of blödite-type structure $Na_2M(SO_4)_2.4H_2O$ (M=Zn, Mg) and Kröhnkite compounds $Na_2Cu(SO_4)_2.2H_2O$ are reported. The preliminary results show a complete reversibility of mixed salts confirmed by XRD, FTIR and RAMAN spectroscopy. On other hand, the thermal analyses show different dehydration temperatures for each material. The mechanism and kinetics of dehydration/hydration reactions under water vapor sorption measurements were studied as well as the thermal efficiency to evaluate the promising salt for solar domestic hot water systems application.