Salt hydrates have been identified as one of the most promising phase change materials for thermal energy storage applications. However, they suffer from two major disadvantages, i.e., supercooling and phase segregation. Supercooling has been prevented, to a large extent, by the use of nucleating agents and cold finger technique. However, the problem of phase segregation has not yet been solved satisfactorily, despite the development of numerous techniques, such as the use of thixotropic-thickening agents, rotating cylinder, direct-contact heat exchangers and extra water principle.

In the present work, an in-depth study of phase segregation associated with the loss of water of crystallization, has been undertaken. Differential thermal analysis combined with thermogravimetry were employed. The kinetics of dehydration of salt hydrates have been evaluated. Existing models were found inadequate for the selection of a best suitable mechanism for the dehydration process. To overcome this inadequacy a criterion has been proposed, in the present study, the use of which result in the selection of an appropriate mechanism for the dehydration of salt hydrates.

Viscosities and densities of salt hydrates investigated, not available in the literature, have been determined at different temperatures. This data is essential for the evaluation of crystallization kinetics and in the design of heat exchangers for thermal energy storage applications. Based
on the data of this work and that available in literature, generalised correlations have been developed for the prediction of viscosity and density of salt hydrates. Viscosities and densities are predicted to ± 5 and ± 0.5 percent, respectively.