Synthesis and thermal analysis of phosphate mixture and its composites as thermal energy conserve material in household building

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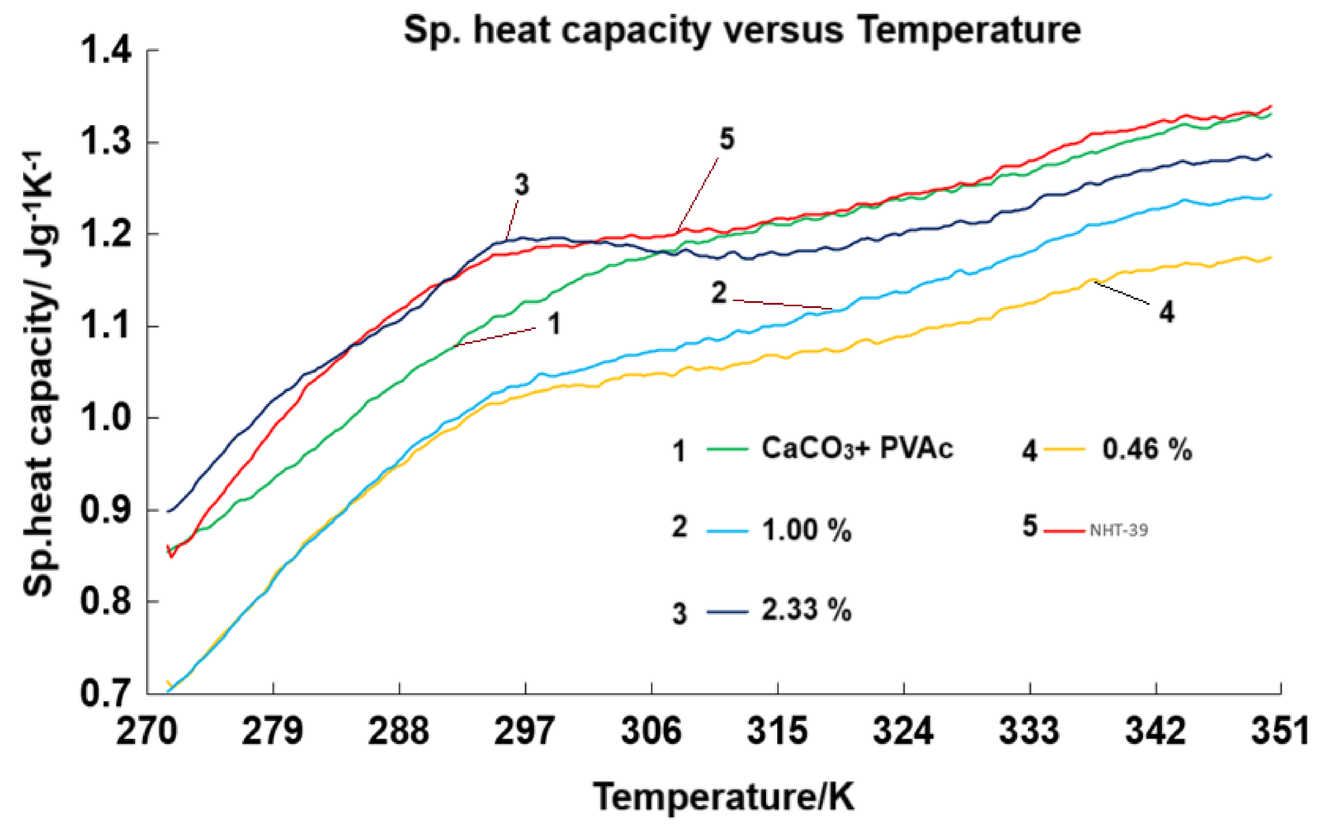
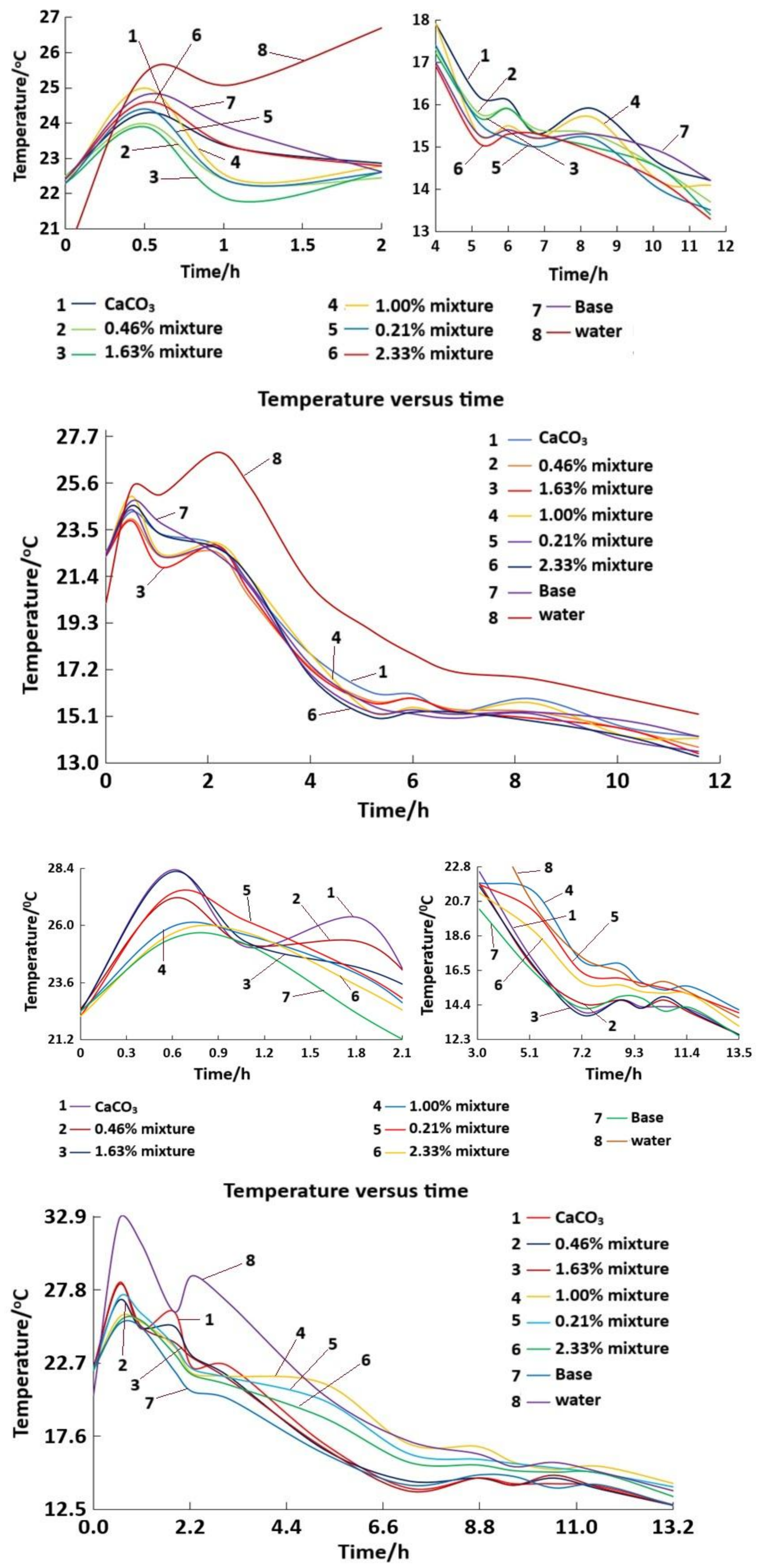
Abstract

Many phosphate-based materials have recently been developed for their versatile applications in various fields, from biomaterials to hydrogen storage and coating materials. Conventional synthetic methods synthesise tetravalent and monovalent metal phosphates. Researchers used various organic molecules or ions to synthesise divalent and trivalent metal phosphates. A mechanochemical method synthesises many phosphate-based materials such as $Cd(O_3PPh)$. H_2O, $Cd(HO_3PPh)_2$, etc.. In the last few decades, mechanochemical methods have been adopted to synthesise many materials due to the increased importance towards green and sustainable chemistry. This method uses mechanical energy for grinding or milling to create a reaction between reactant solids. This method uses either no solvent or very little. The mixture $Cu_3(PO_4)_2$· 0.13$(NH_4)_2SO_4$ and its composites, 0.71 % (A1), 1.70 % (A2) and 2.22 % (A3) of the mixture, with wall care putty were synthesised in ambient conditions. Different measurement techniques characterised the composite coatings and the mixture. The optimum value of Cp is 1.20 $Jg^{-1}K^{-1}$at 327.35 K for the mixture. This mixture behaves as weak paramagnetic, confirmed by the study of magnetic properties. Out of the various composite coatings, the optimum CP, 2.11 $Jg^{-1}K^{-1}$ at 284.81 K, is observed in a coating containing a 2.22 % mixture in wall care putty. The crystallite size and crystallinity of this composite coating are 54.73 nm and 83.9%, respectively. The crystallinity of all other composite coatings is 83.9% to 84.5%.

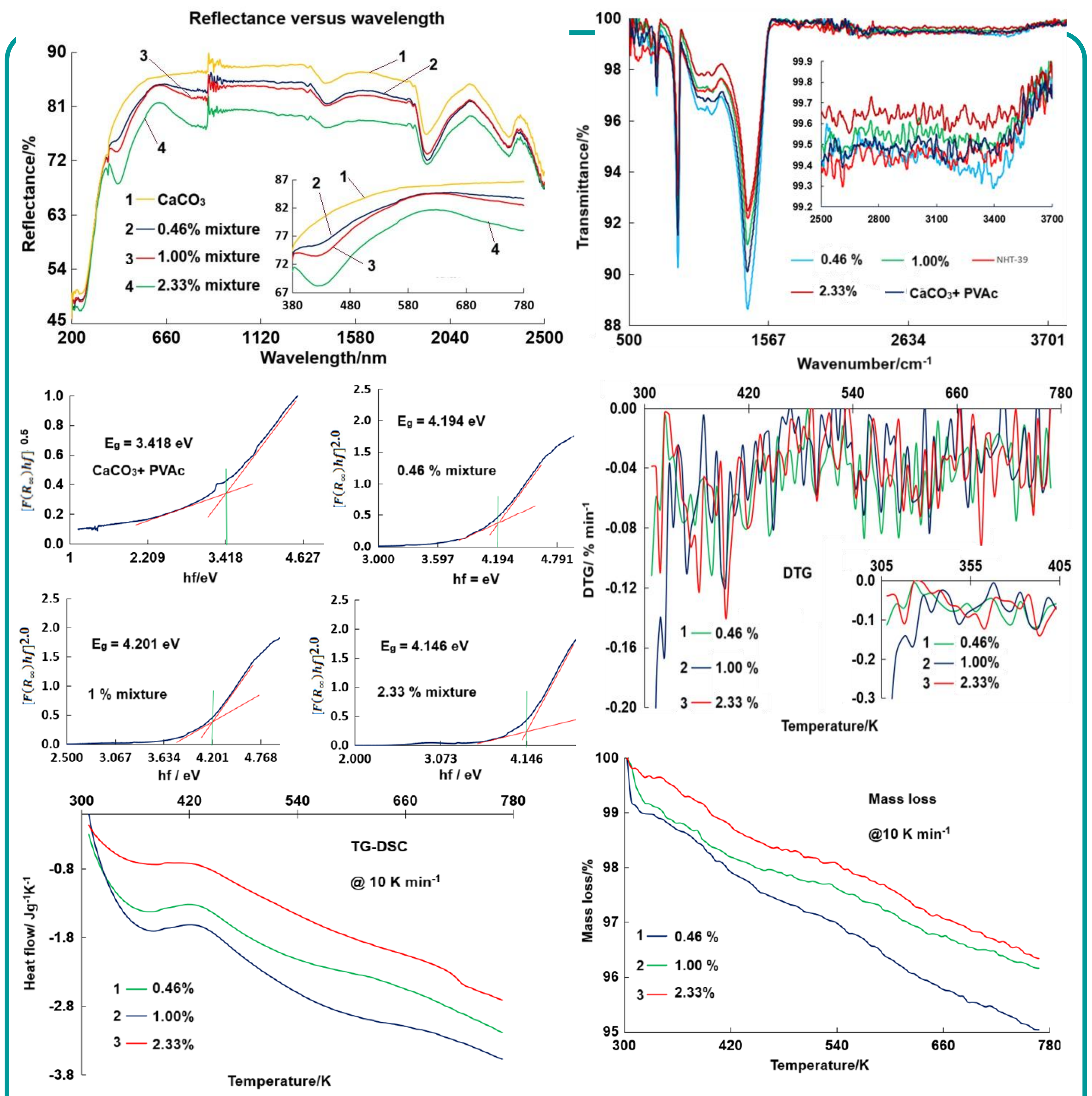
Specific heat capacity

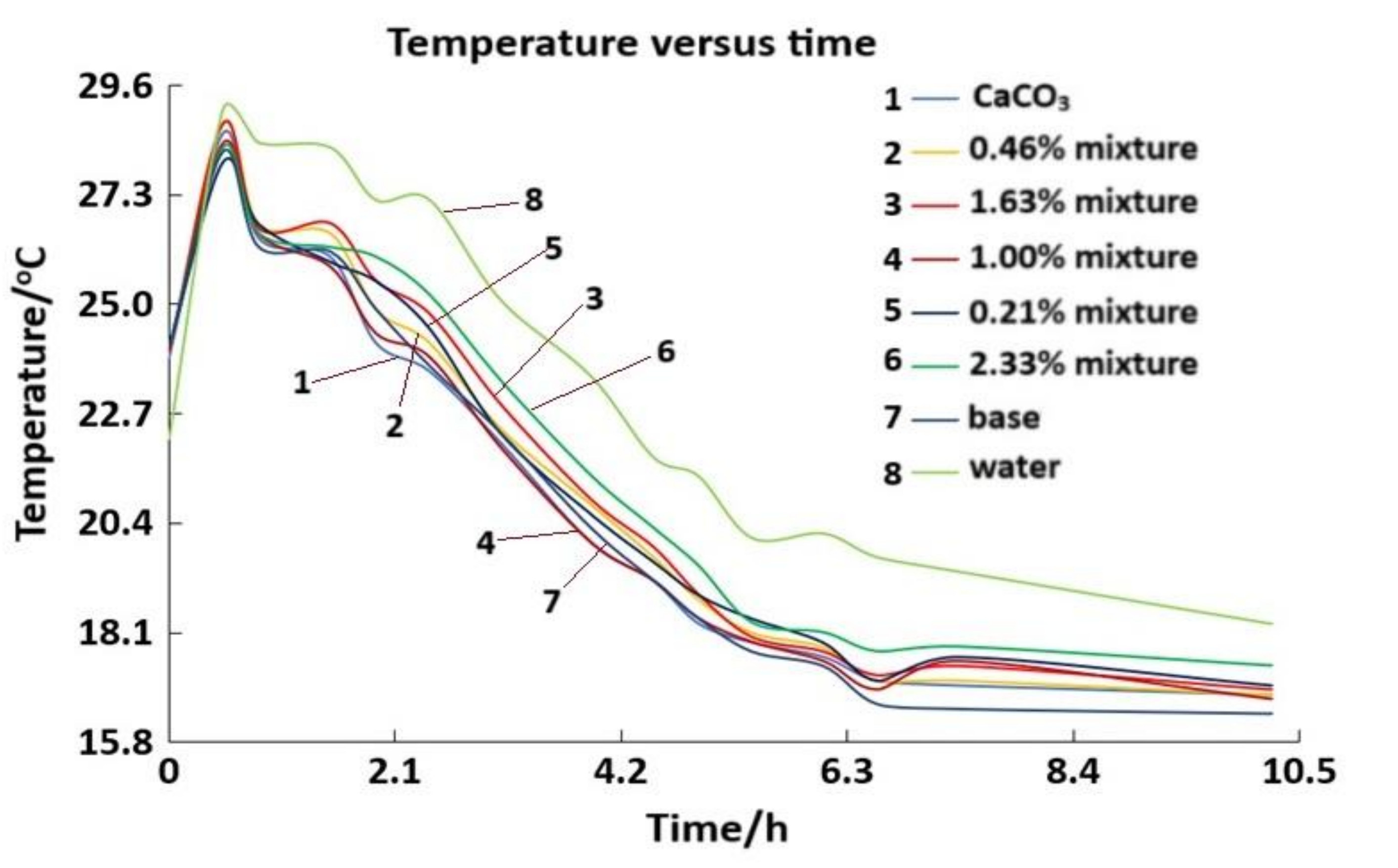


Temperature measurement



Results





Conclusions

All the composites can be used as thermal heat storage. These composites function as moisture based sensible thermal storage materials.

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