**Development of a salt-impregnated SAPO-34 porous matrix with graphene oxide for water sorption applications**

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**Abstract**

Drought-hit areas continue to be affected by the water shortage problem with estimations indicating that about 4 billion of the world population live in such areas for at least a month, while half a billion are severely affected all year round. Composites “Salt Inside Porous Matrix” (CSPMs) are promising materials for atmospheric water adsorption/generation. In this work, CSPMs were synthesized by impregnating porous SAPO-34 with hygroscopic salts (LiCl and/or CaCl2), and further functionalized with incorporation of graphene oxide (GO). The physicochemical, morphological, and textural properties of the resulting hybrids were evaluated. It was found that the confinement of binary salt systems to the porous matrix yielded the highest performance with a water uptake capacity of 0.877 gwater/gadsorbent at 25 oC and 90% relative humidity, which was four times higher than that of the untreated SAPO-34. The experimental water vapor adsorption data were found to follow the linear driving force (LDF) model, while the obtained water adsorption isotherms were fitted to Langmuir, Sips, Freundlich, FHH and GAB models by least-square non-linear regression, as to identify and select the best-fit model and explain the adsorption behavior. The binary salt - impregnated sample showed also good cyclability, with a slight capacity decrease attributed to structural deterioration during regeneration. Experiments with mono-salt – impregnated structures indicated that CaCl2 was more easily leached off the SAPO-34 matrix than LiCl.

**Keywords:** Aluminophosphates; water sorption; hygroscopic salts; SAPO-34; CaCl2; LiCl; adsorption, atmospheric water generation