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Hydration of hexagonally ordered mesoporous silica

(MCM-41 and SBA-15)



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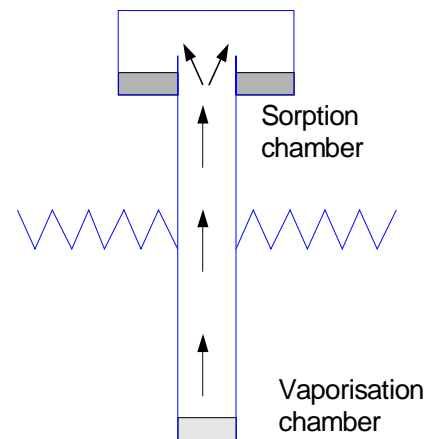


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Method of Sorption Calorimetry

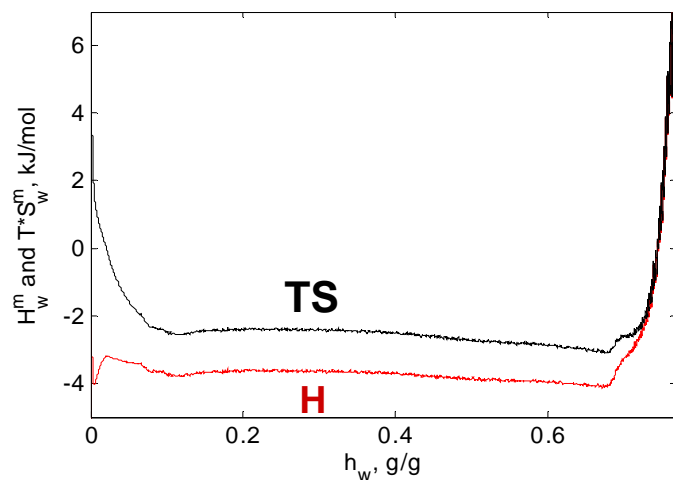
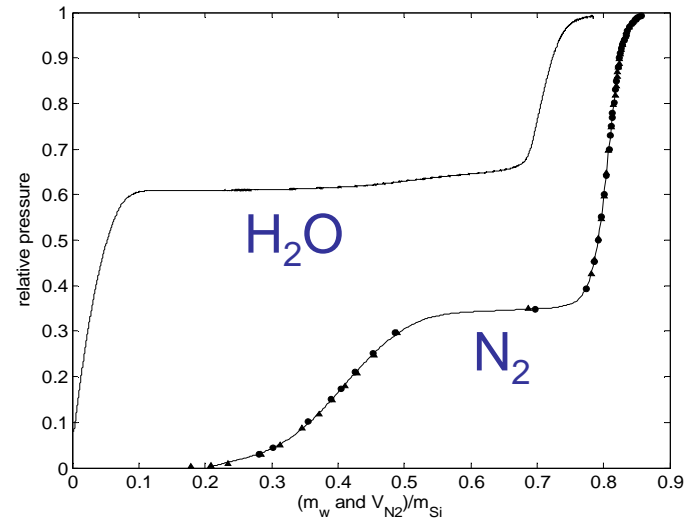
In a sorption calorimetric experiment we measure the water activity and the enthalpy of hydration simultaneously

$$n_w = \frac{\int P^{vap} dt}{H_w^{vap}}$$
$$a_w = 1 - \frac{P^{vap}}{P_{max}^{vap}}$$



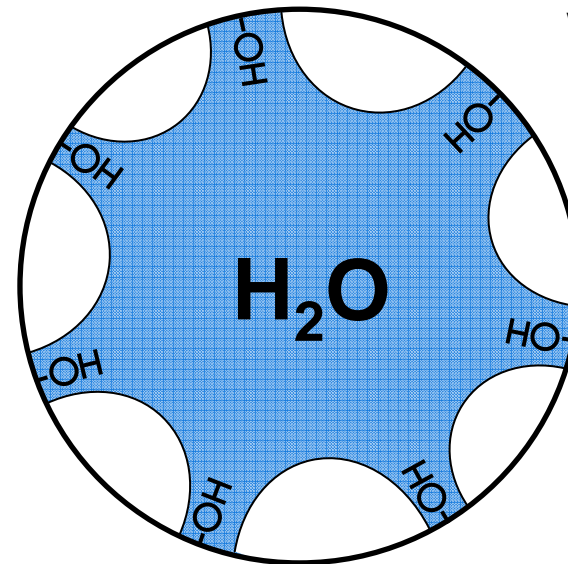
$$H_w^{mix} = H_w^{vap} + P^{sorp} \frac{H_w^{vap}}{P^{vap}}$$

Proposed mechanism of capillary condensation of water in MCM-41



- MCM-41 takes up greater volume of nitrogen compared to volume of water
- Enthalpy and entropy of hydration are negative

Apparent density of water is 0.88



When small cavities are hydrated, the hydrogen bonds are preserved. But it causes ordering of water.