



HYDRATION EFFECT ON INTERACTIONS OF ORGANIC COMPOUNDS WITH ORGANOCLOYS

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I. Research Problem: effect of water on interactions of organic compounds in the organoclay phase

II. Methodology: activity-based comparison of sorption isotherms of a probe organic compound onto sorbent immersed in water (wet system) and inert solvent, *n*-hexadecane (*n*-C₁₆H₃₄; "dry" system)

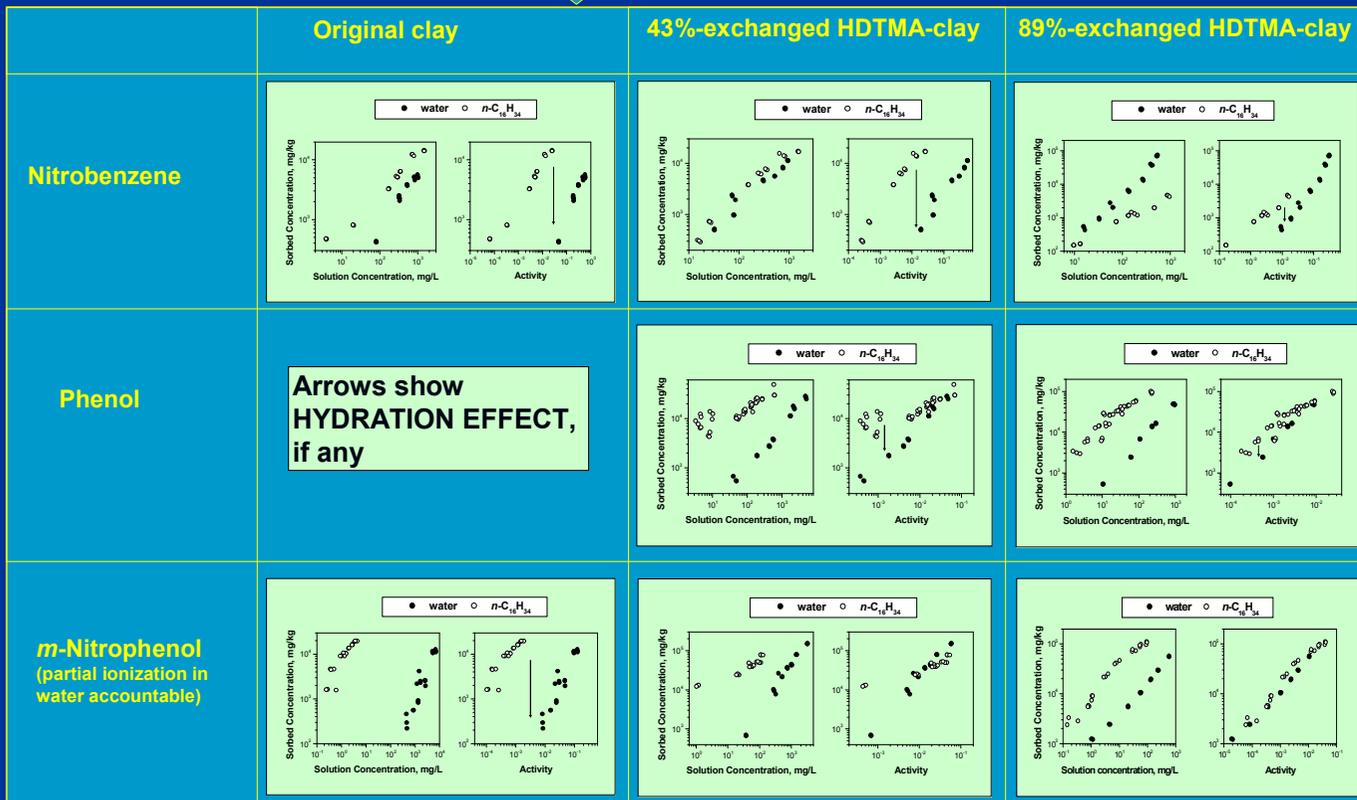
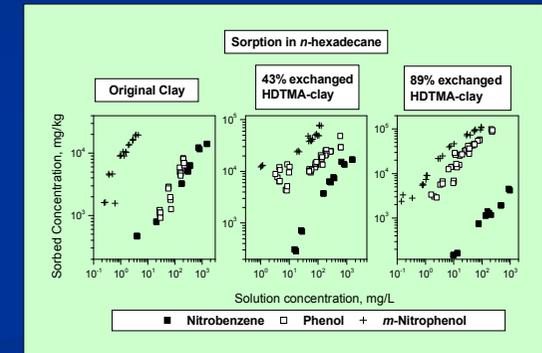
$$\text{compound activity} = \frac{\text{equilibrium solute concentration} \times \text{Henry coefficient}}{\text{saturated vapor concentration over pure liquid compound}}$$

Left graph: sorbed phase concentration vs. solution concentration: → In which medium is sorption greater?

Right graph: sorbed phase concentration vs. activity: → the solvent effect on compound interactions *in the sorbent phase*

III. Sorbents: bentonite (Wyoming-Na) and its forms HDTMA- exchanged by 43% -and 89% of CEC [HDTMA: (*n*-C₁₆H₃₃)(CH₃)₃N⁺]; freeze-dried with residual moisture <3% w/w

IV. Sorbates: nitrobenzene < phenol < *m*-nitrophenol [capability to interact, see the below graph on sorption in *n*-hexadecane]; regular replicated kinetically-controlled sorption batch experiment



V. Conclusions

- “Simple” mechanistic vision of organic compound interactions in the organoclay phase: based on sorbate-solvent competition consideration
- in line with earlier studies of non-polar organic compound sorption onto small organic cation-based organoclays (Lee et al., 1990; Kukkadapu and Boyd, 1995)
- Successful sorbate-water competition for sorbates capable of stronger interactions (i.e. phenols) involves apparent lack of the hydration effect on interactions in the sorbent phase

No distinct effect from

- Increased sorbent polarity induced by organoclay hydration
- Water bridges
- Interfacial water
- Hydration-induced creation of greater available surfaces (or volumes) due to
 - breaking the organoclay aggregates
 - hydration-induced swelling