



# HYDRATION EFFECT ON INTERACTIONS OF ORGANIC COMPOUNDS WITH ORGANOCLAYS

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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*-C<sub>16</sub>H<sub>34</sub>; "dry" system)

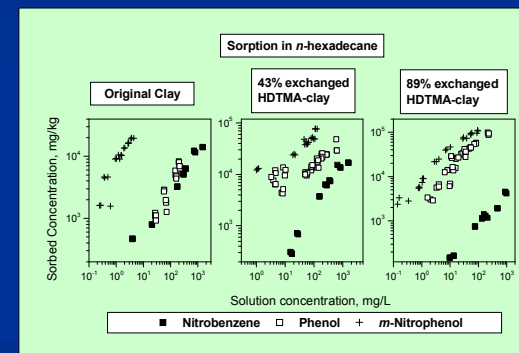
$$\text{compound activity} = \frac{\text{equilibrium solute concentration} \times \text{Henry coefficient}}{\text{saturated vapor concentration over pure liquid compound}}$$

**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*-C<sub>16</sub>H<sub>33</sub>)(CH<sub>3</sub>)<sub>3</sub>N<sup>+</sup>]; 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

