

PYRENE SORPTION TO AND EXTRACTION FROM CORN STOVER CHAR

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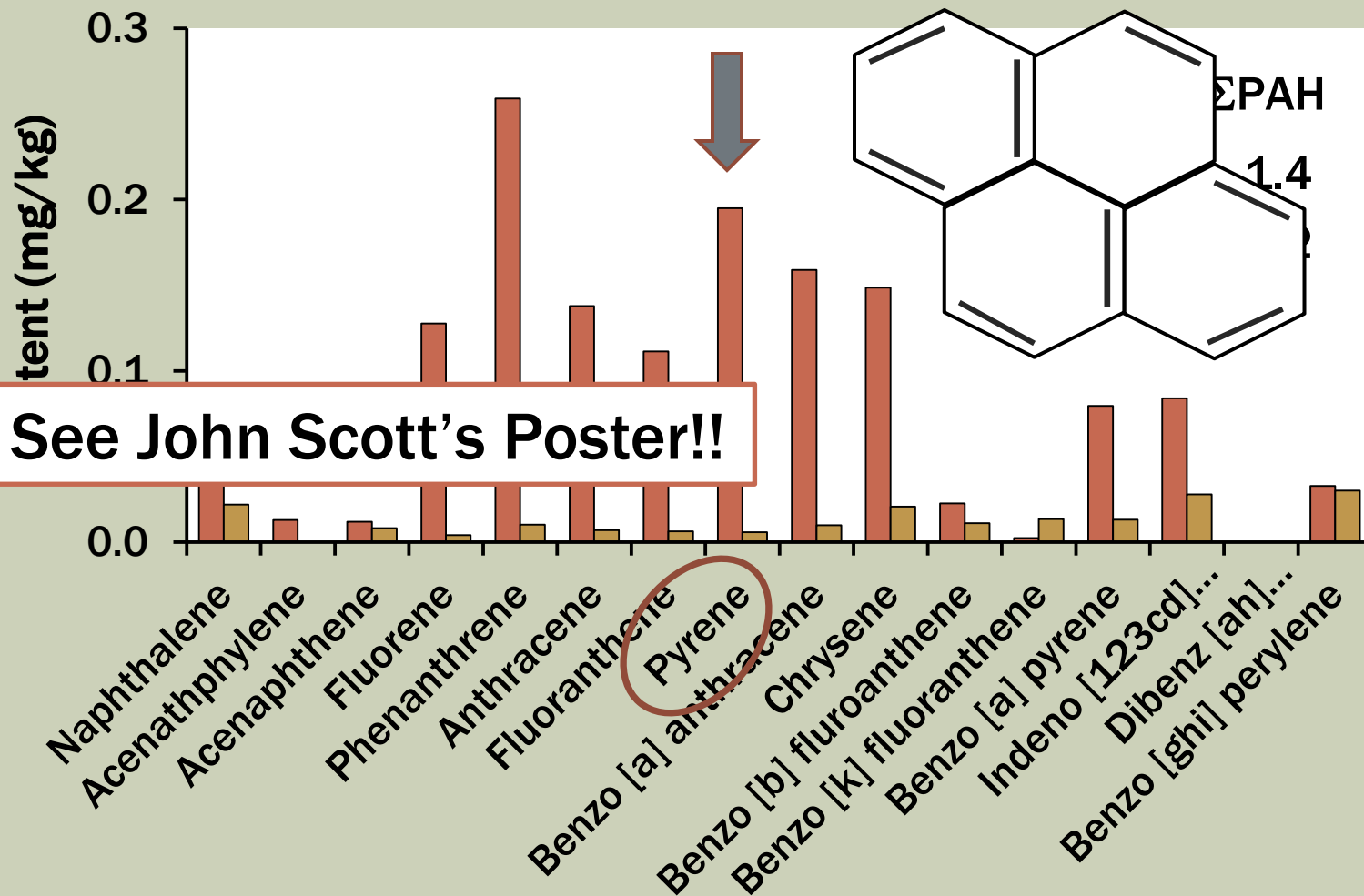
ILLINOIS

BIOCHAR PREPARATION

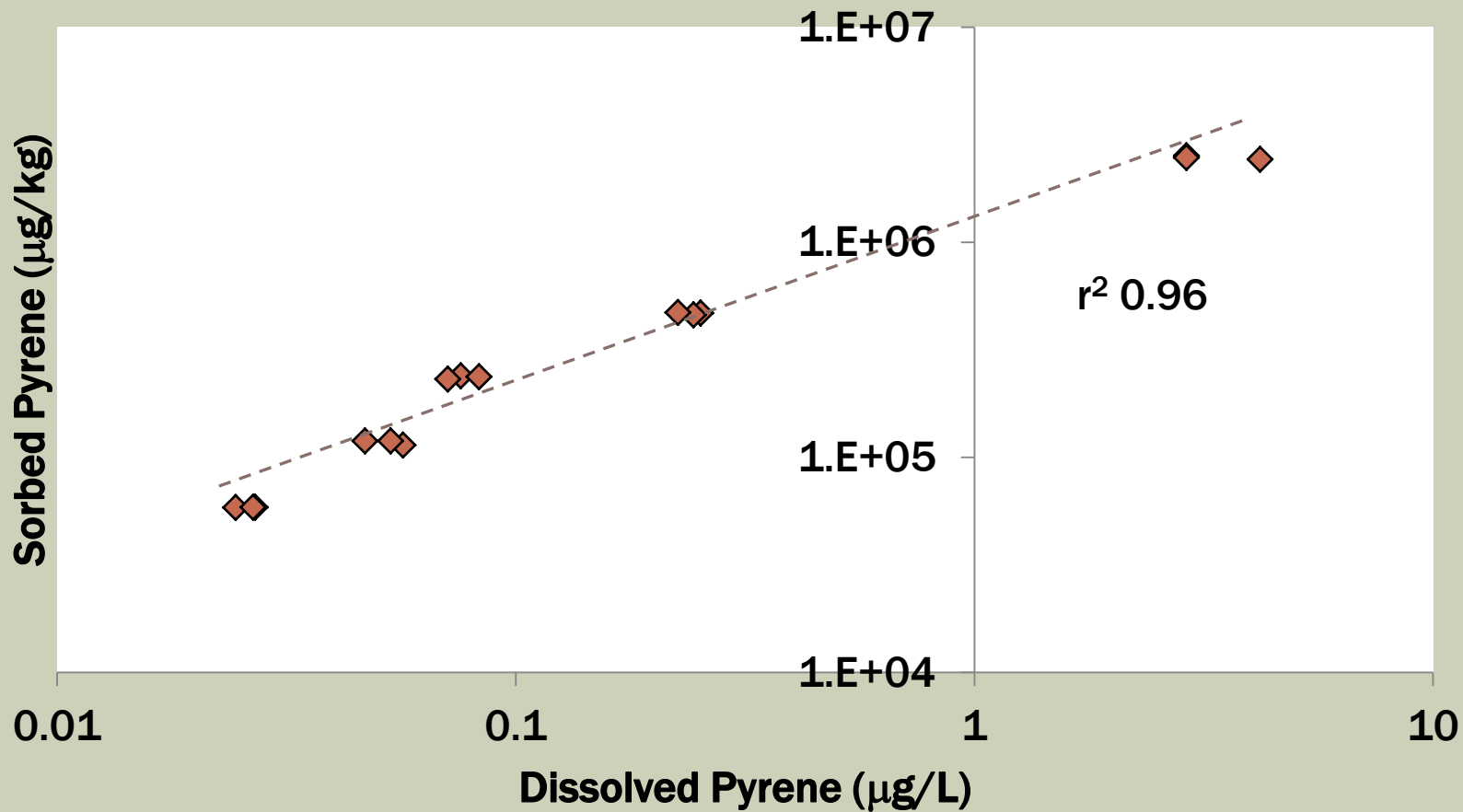
- Corn stover
- Pyrolysis
 - 450 °C
 - 550 °C
 - 750 °C
- N₂ atmosphere



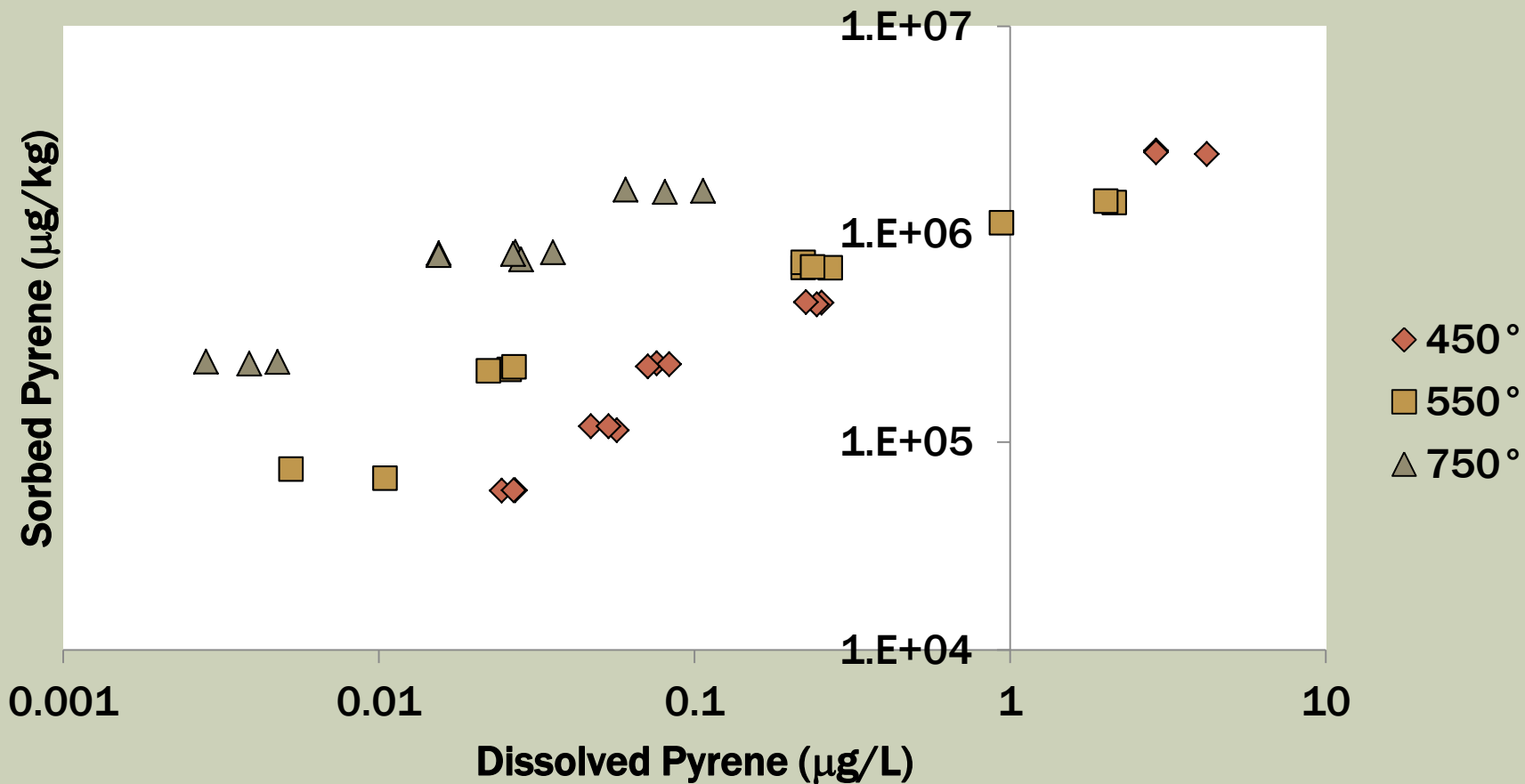
USEPA-16 PAH CONTENT OF CORN STOVER CHAR



SORPTION ISOTHERM 450 ° CHAR



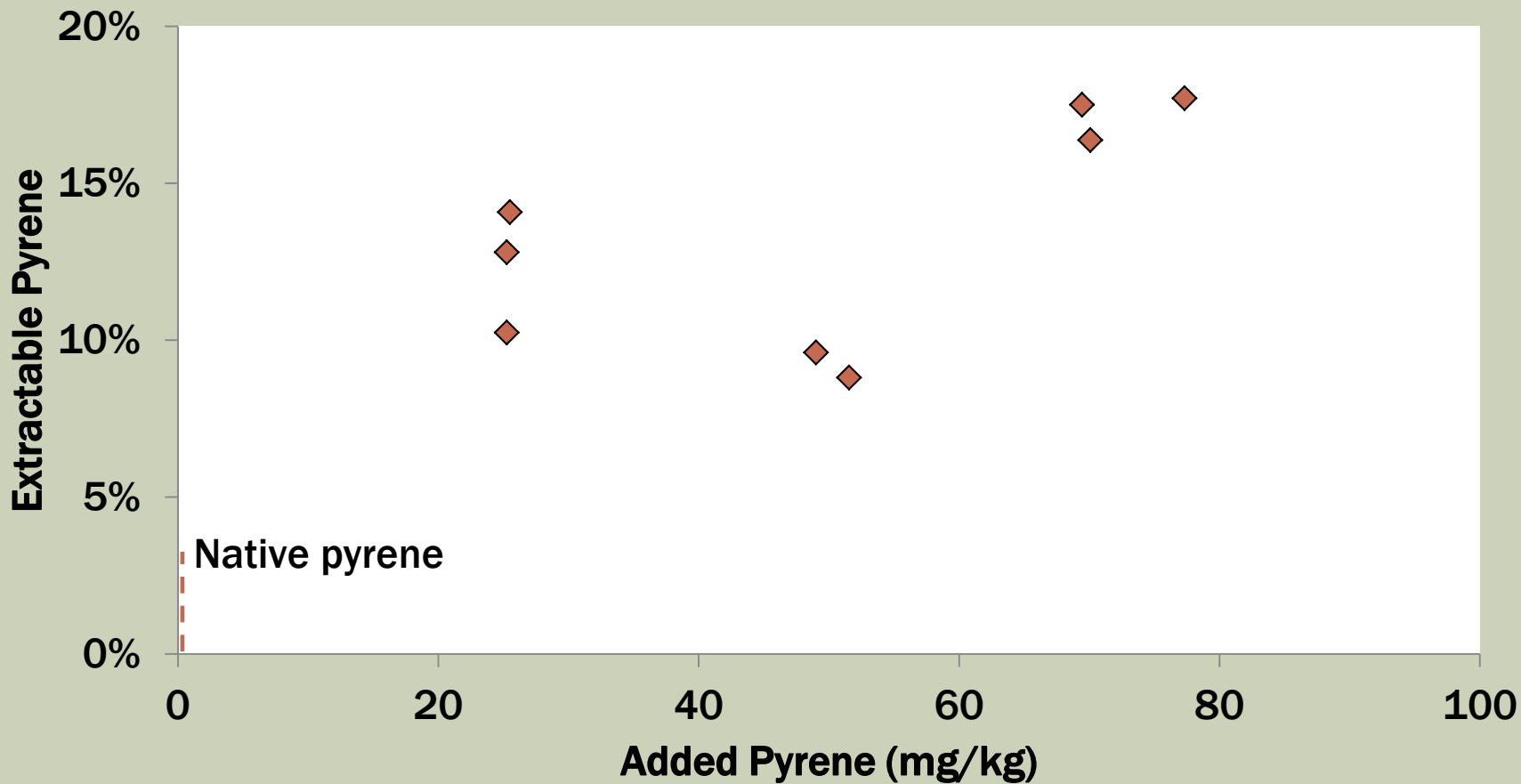
SORPTION ISOTHERMS, FRESH CHAR



BIOAVAILABILITY-RELATED EXPERIMENTS

- Mild extractions with 2-hydroxypropyl- β -cyclodextrin (HPCD)
- HPCD-extractable PAHs correlate well with
 - Bioavailability
 - Biodegradation
- Poor correlation with total PAH content

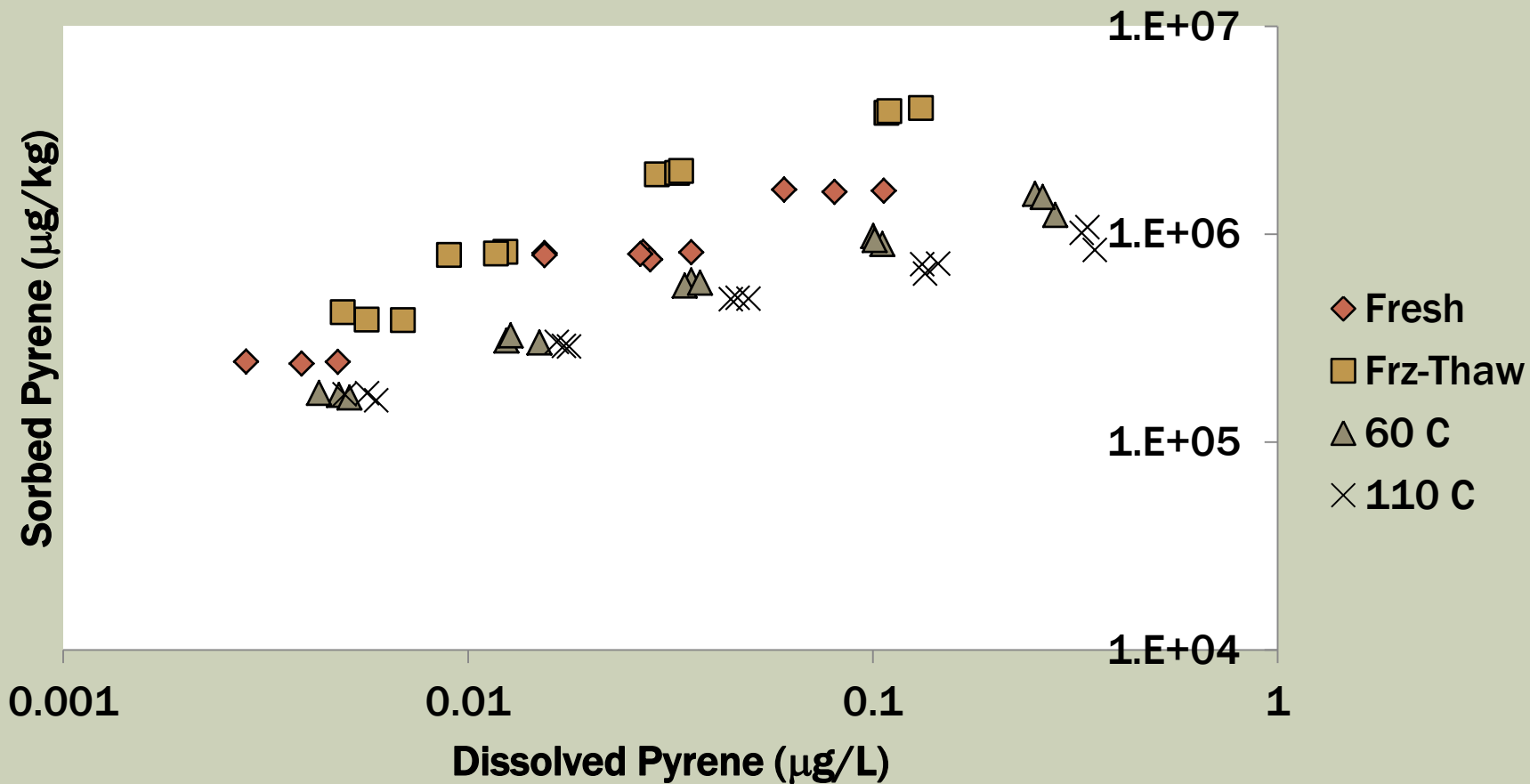
HPCD-EXTRACTABLE PYRENE 450 ° CHAR



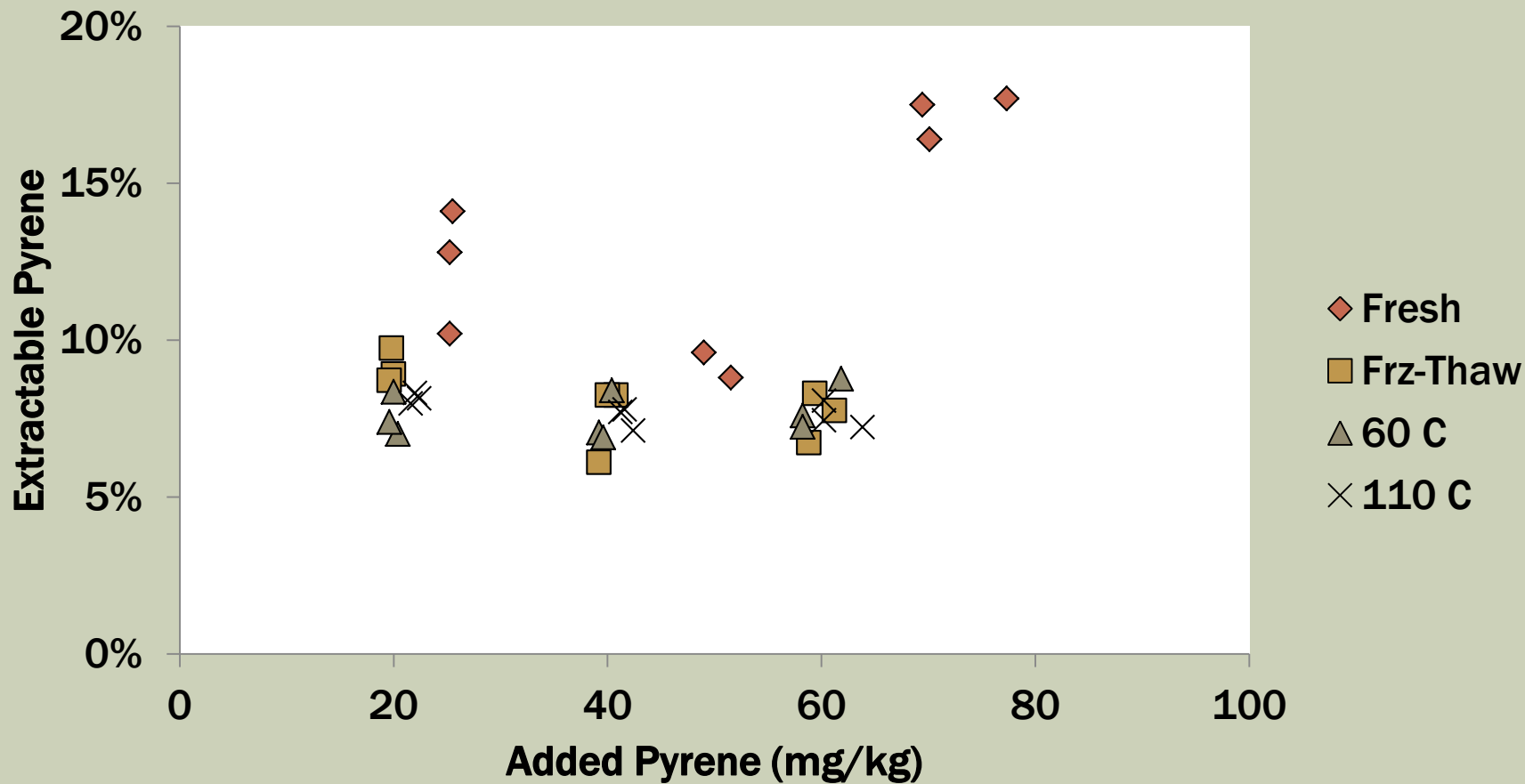
ARTIFICIAL AGING

- Hale et al. (2011)
- 40% field capacity (moisture)
- Incubate 1 month
 - Freeze/Thaw
 - 60 °C
 - 110 °C

SORPTION ISOTHERMS, AGED AND FRESH 750 ° CHAR

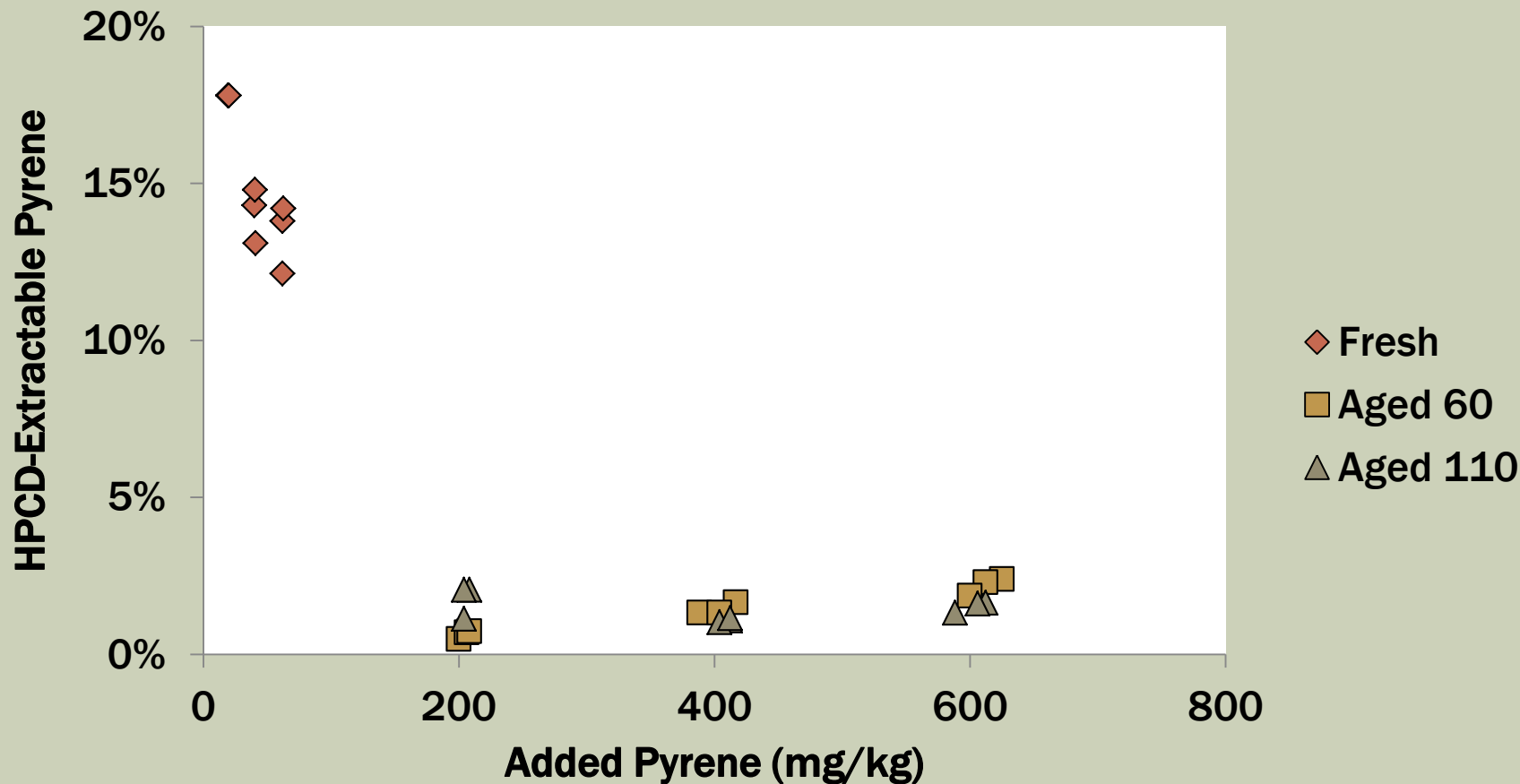


HPCD-EXTRACTABLE PYRENE 450 ° CHAR, FRESH & AGED



HPCD-EXTRACTABLE PYRENE

550 ° CHAR, FRESH & AGED



CONCLUSIONS, PAH SORPTION

- PAHs sorb strongly to corn stover char
 - Freundlich isotherm
 - $6 < \text{Log } K < 7$ for fresh char
 - For native PAHs, solubility $\ll 1$ ng/L

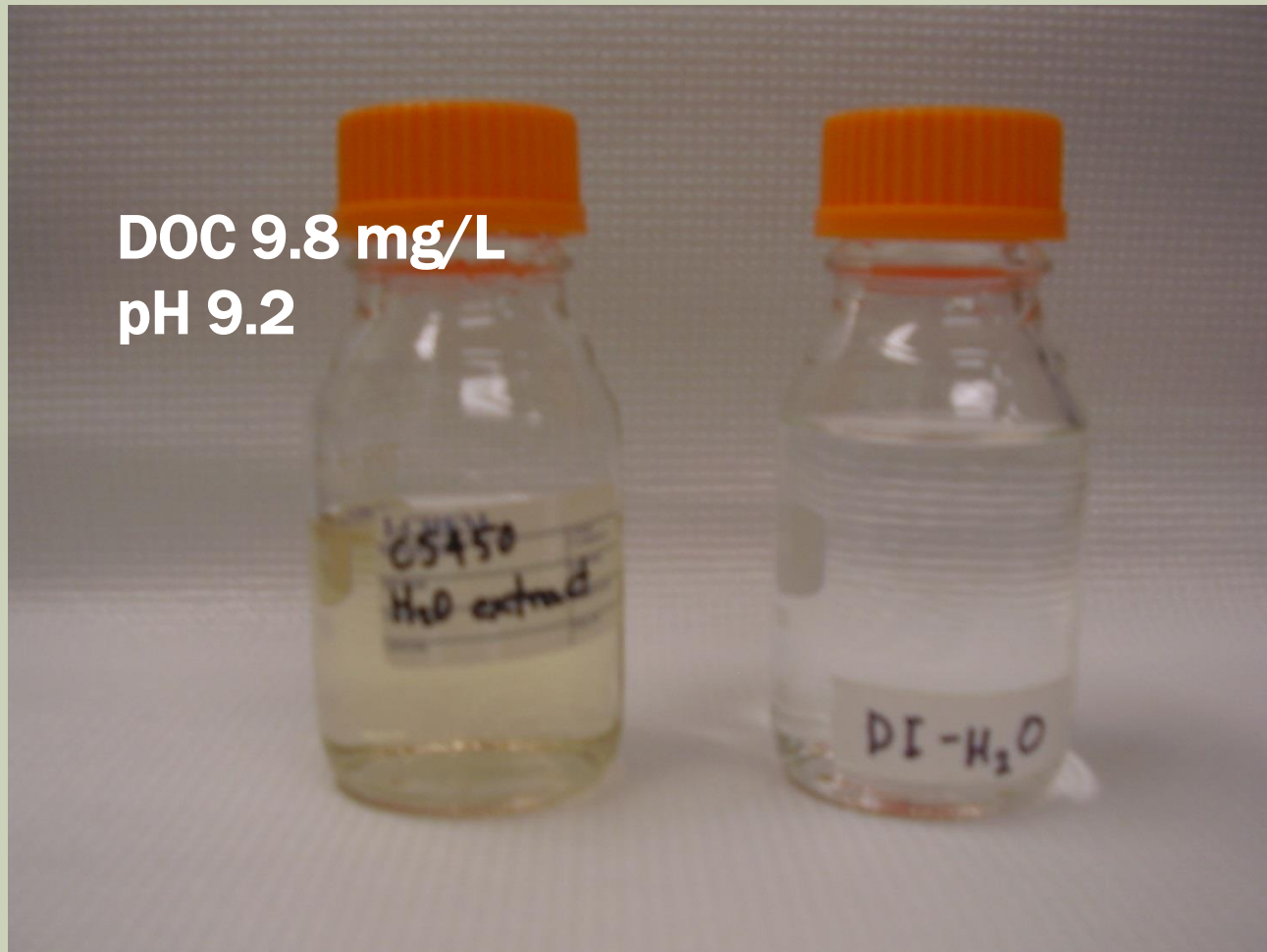
CONCLUSIONS, PAH BIOAVAILABILITY

- Small fraction of pyrene is bioavailable (HPCD-extractable)
 - 10-15% 450° char
 - 1-3% 550°, 750° chars

CONCLUSIONS, CHAR AGING

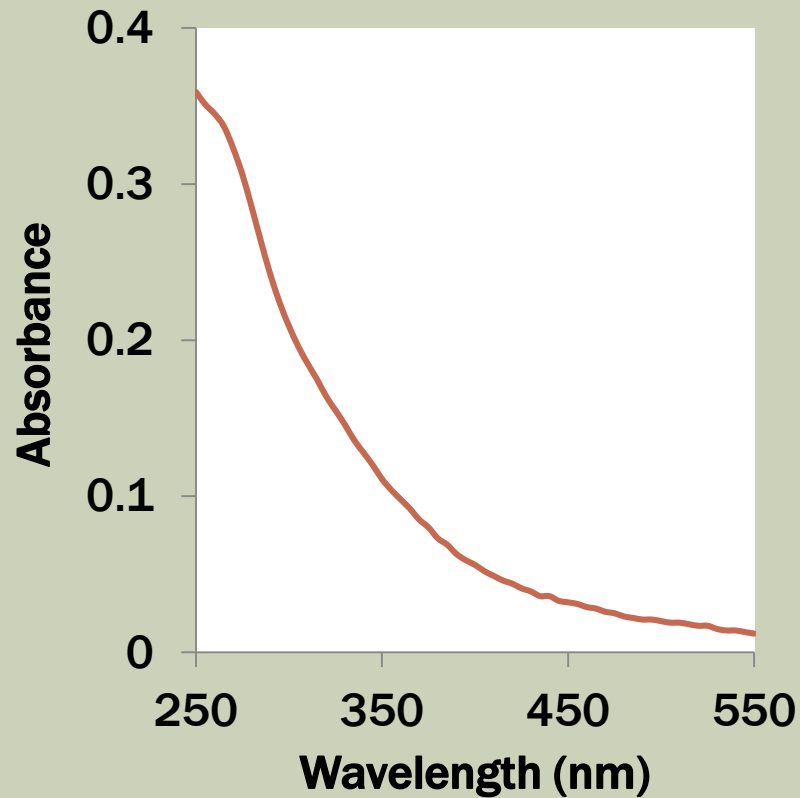
- (Artificial) aging has small effects on PAH sorption
 - $\Delta \text{Log } K$ for pyrene ≤ 0.5
- Aging effect on PAH bioavailability
 - 450° char: decrease
 - 550° char: large decrease (?)
 - 750° char: no effect

WATER-SOLUBLE BLACK CARBON

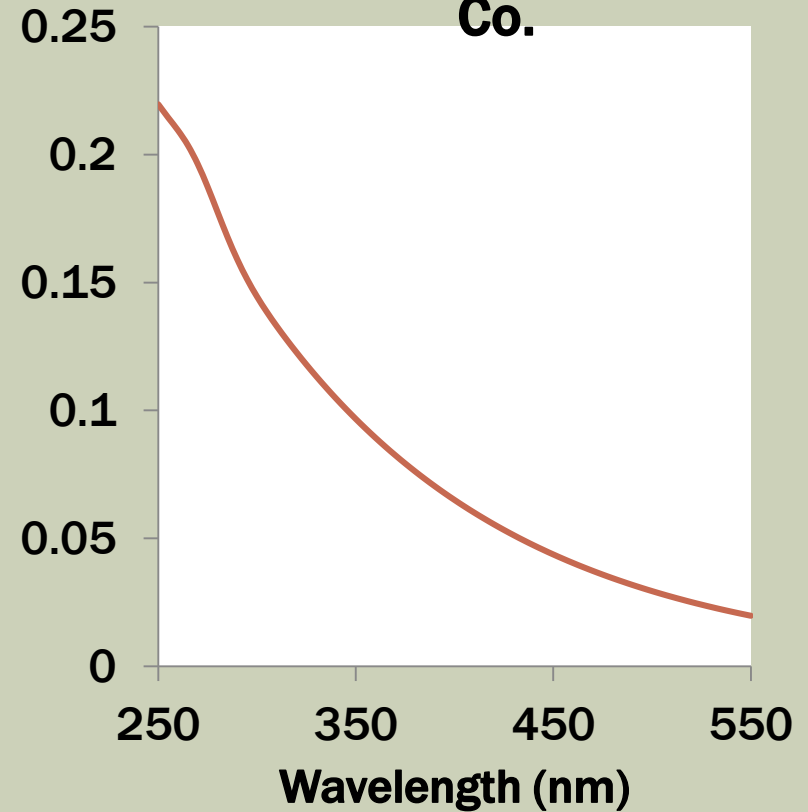


ABSORBANCE SPECTRUM, WATER EXTRACT OF CS450

CS450 Water Extract

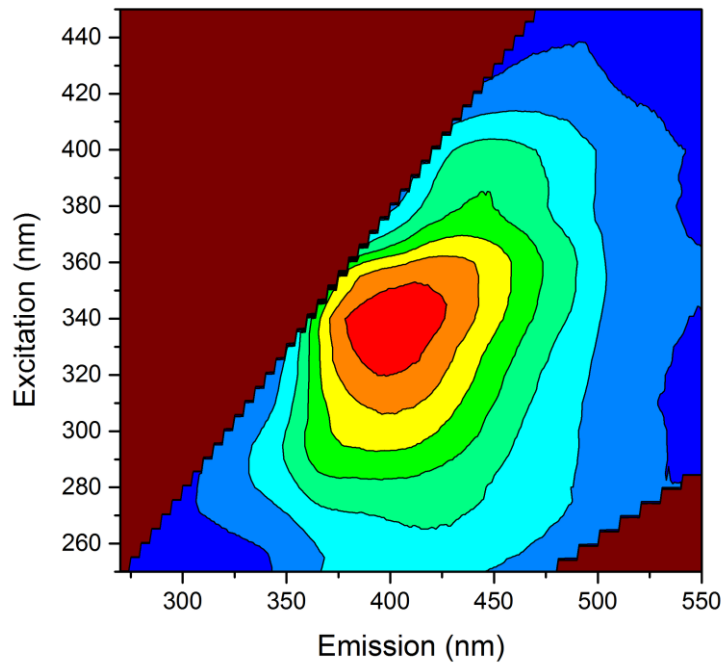


Groundwater, Champaign Co.

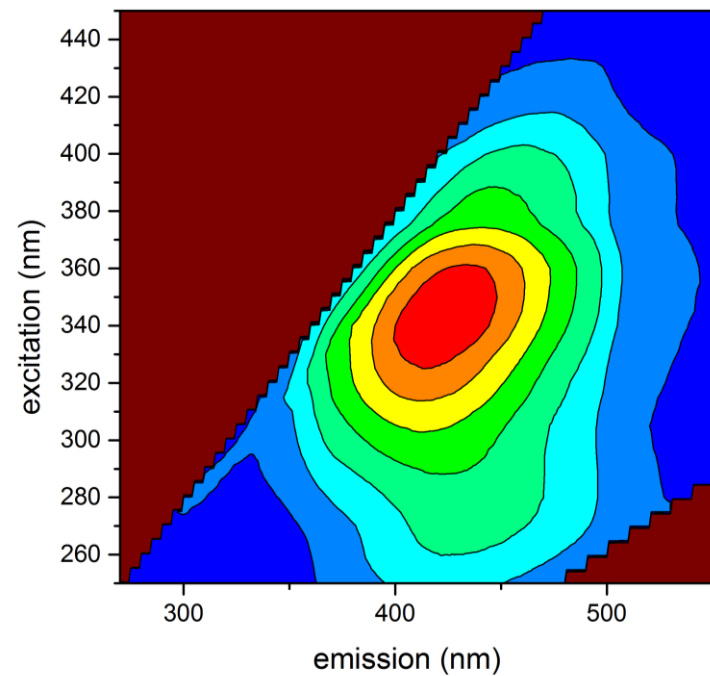


FLUORESCENCE EXCITATION-EMISSION SPECTRA

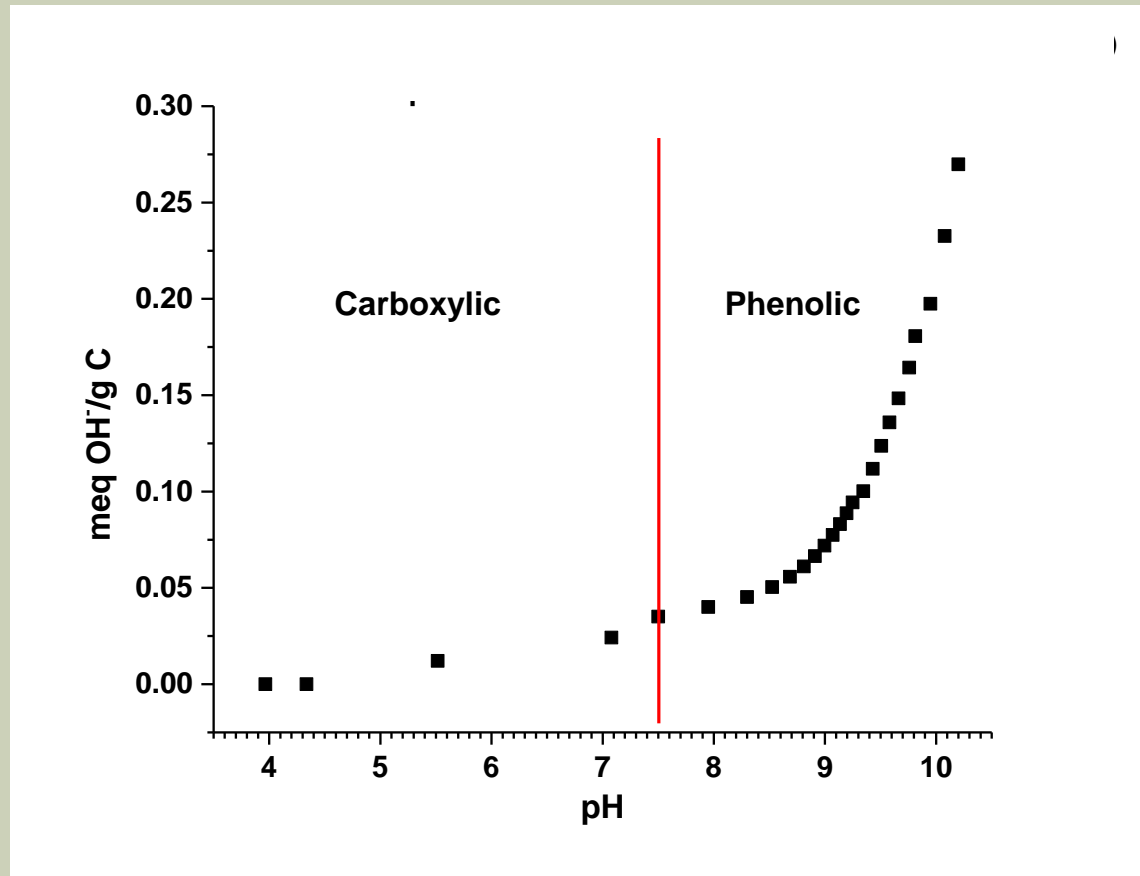
CS450 Water Extract



Groundwater, Champaign Co.



BASE TITRATION, WATER EXTRACT OF CS450



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