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CEE 680: Water Chemistry

Lecture #40
Precipitation and Dissolution: Metal
Carbonates & Hydroxides
(Stumm & Morgan, Chapt.7)
Benjamin; Chapter 8.7-8.15

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Topics

- Ferrous Carbonate
 - vs C_T
- Mixed carbonate/hydroxide diagrams
 - Log C vs pH
 - Predominance diagrams

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Siderite

- Ferrous Carbonate
- Images from Wikipedia



Ferrous Carbonate/Hydroxide

| | <u>Log K</u> |
|--|--------------|
| • Hydroxide Equilibria | |
| K_{so}^{OH} • $Fe(OH)_2(s) = Fe^{+2} + 2OH^-$ | -14.5 |
| K_1 • $Fe(OH)_2(s) = FeOH^+ + OH^-$ | -9.4 |
| K_2 • $Fe(OH)_2(s) + OH^- = Fe(OH)_3^-$ | -5.1 |
| • Carbonate Equilibria | |
| $K_{so}^{CO_3}$ • $FeCO_3(s) = Fe^{+2} + CO_3^{-2}$ | -10.7 ← |
| K_1 • $FeCO_3(s) + OH^- = FeOH^+ + CO_3^{-2}$ | -5.6 ← |
| K_2 • $FeCO_3(s) + 3OH^- = Fe(OH)_3^- + CO_3^{-2}$ | -1.3 ← |

$$\alpha_2 = \frac{1}{\frac{[H^+]^2}{K_1 K_2} + \frac{[H^+]}{K_2} + 1}$$

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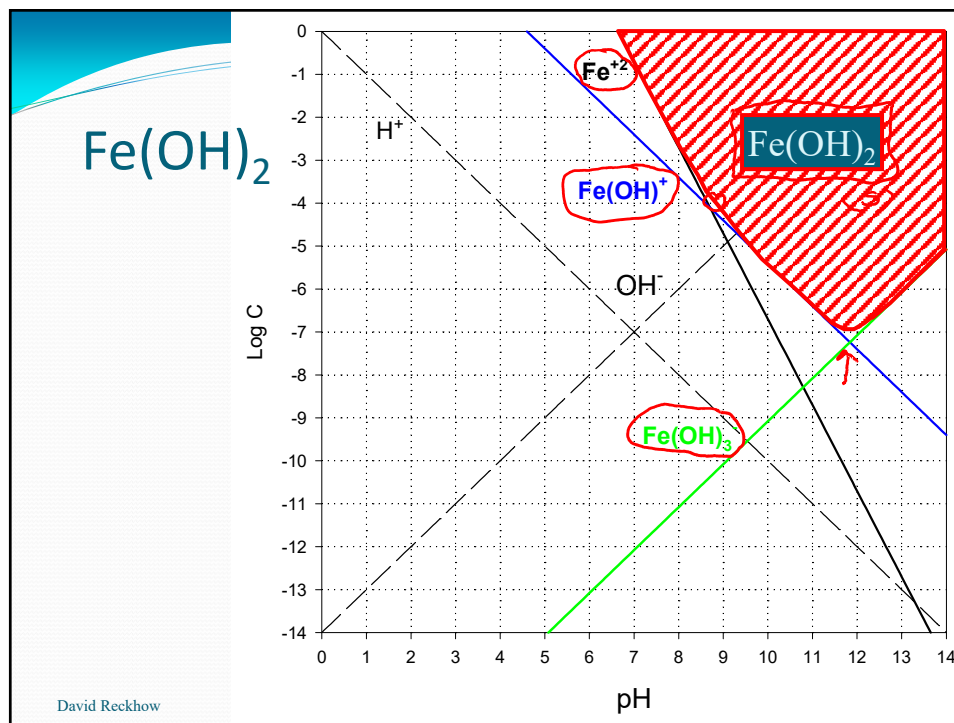
Carbonate and hydroxide system

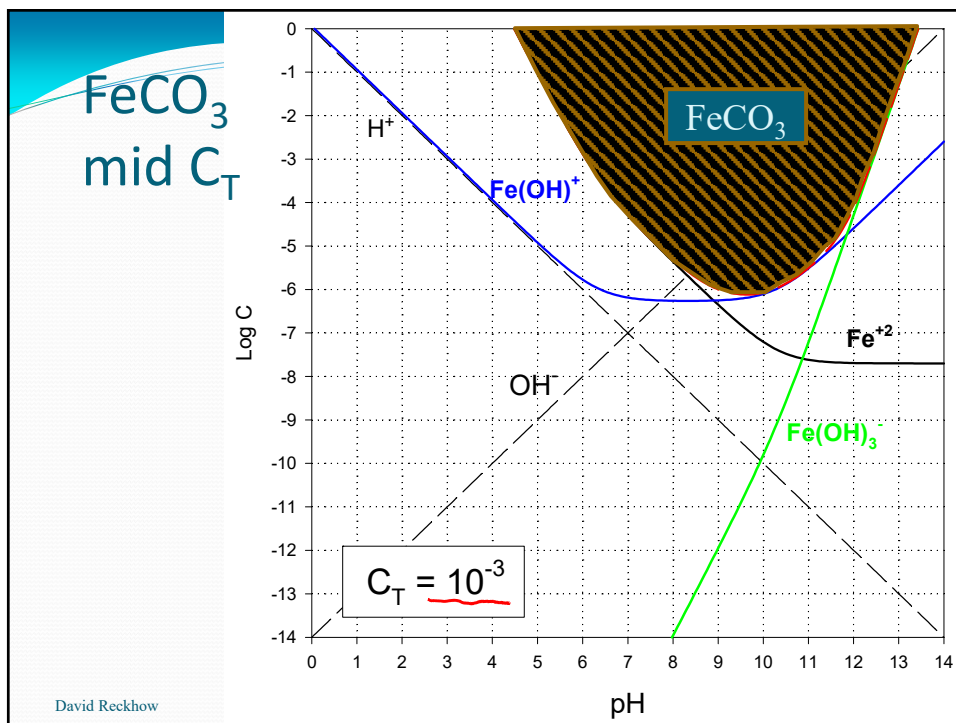
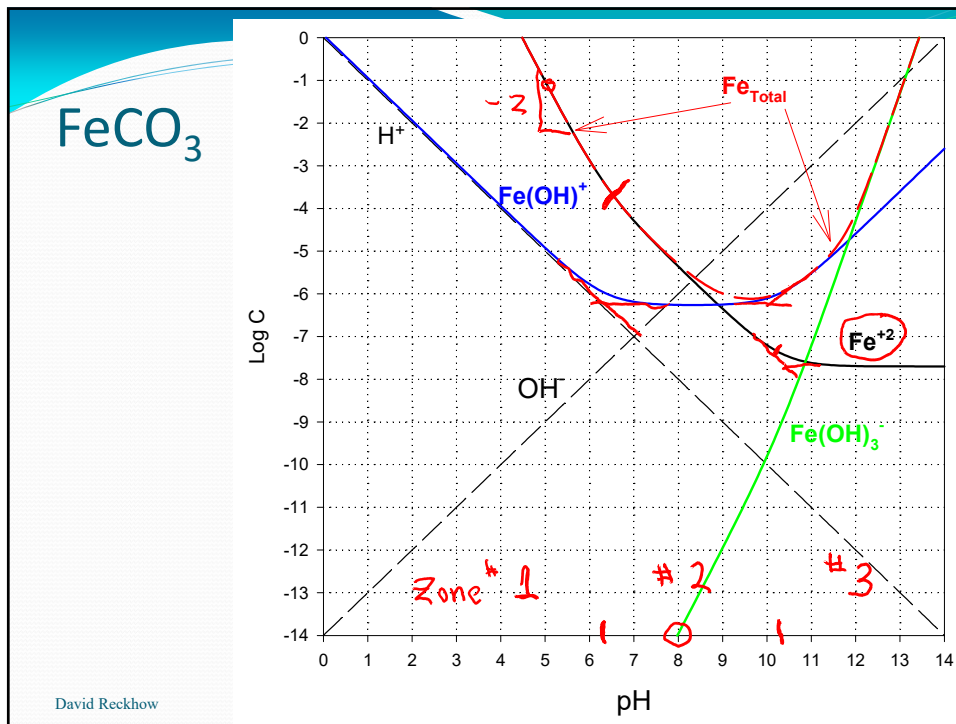
- We could graph the same soluble species in equilibrium with $\text{FeCO}_3(s)$ and plot it versus free log ligand concentration (eg., CO_3^{-2}).
 - This would look a lot like the ferrous hydroxide figure
 - It would not allow us to plot both against the same independent variable
 - It would not help us understand the relative competition between ferrous carbonate and ferrous hydroxide precipitation
- Instead we use a single independent variable (pH) so we can compare the two

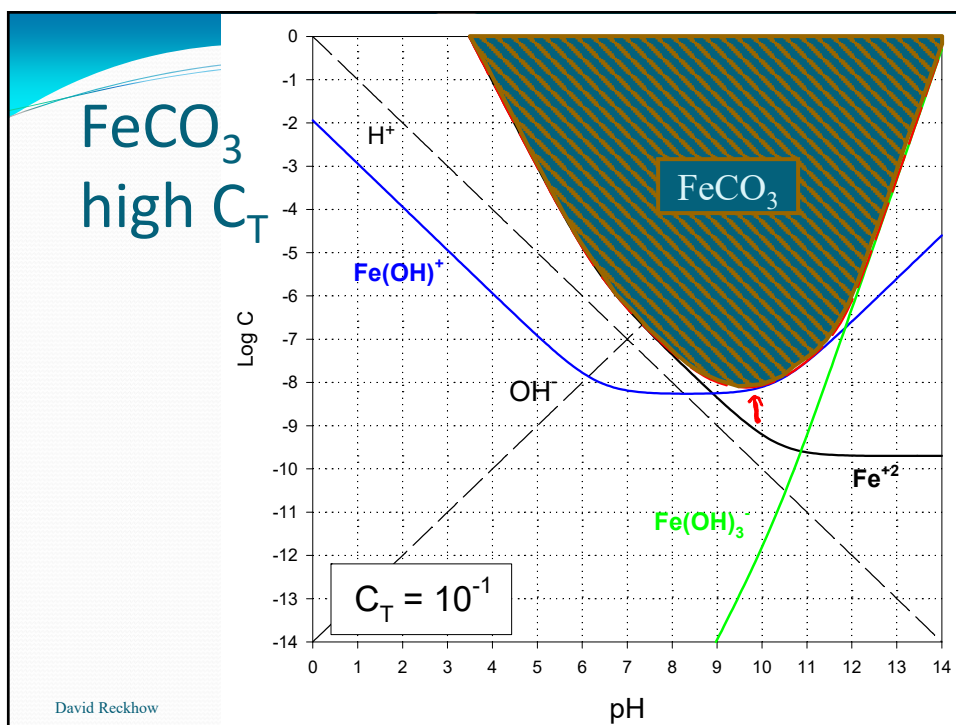
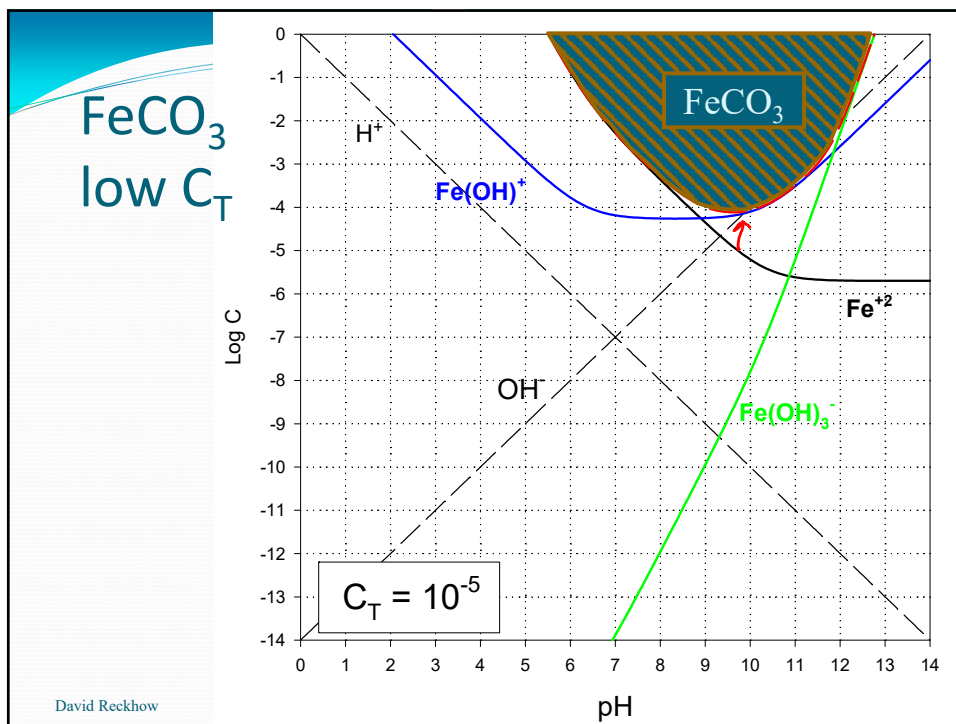
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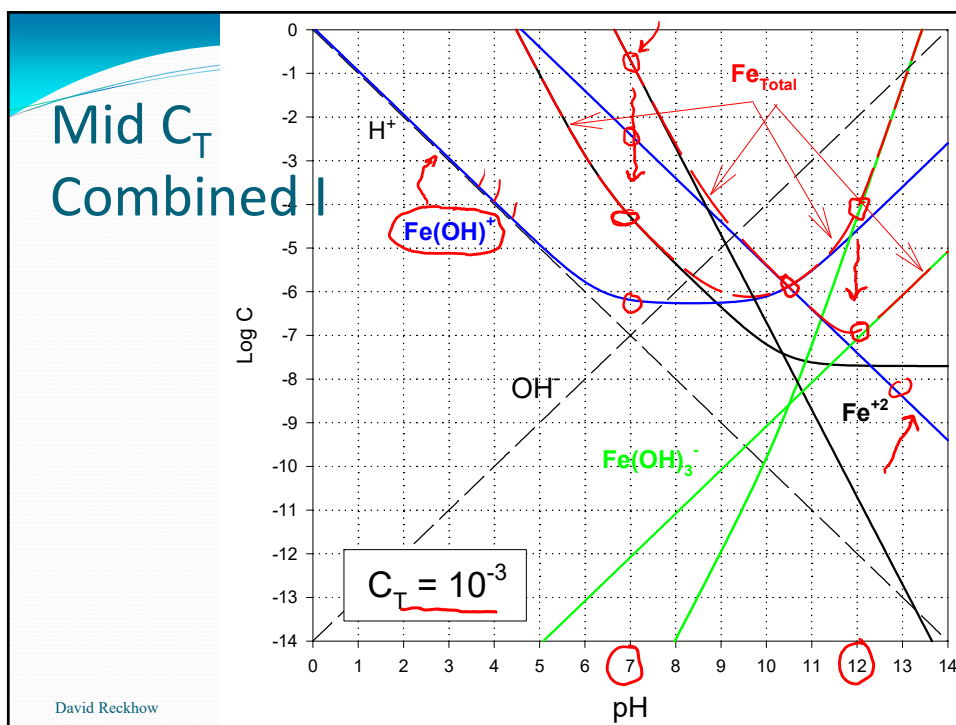
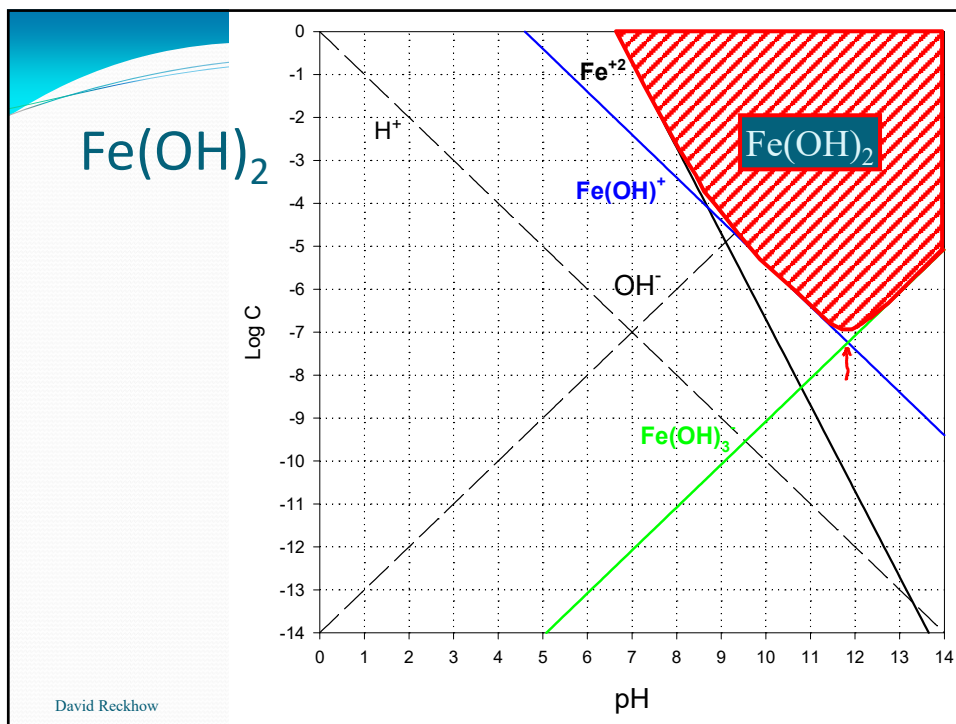
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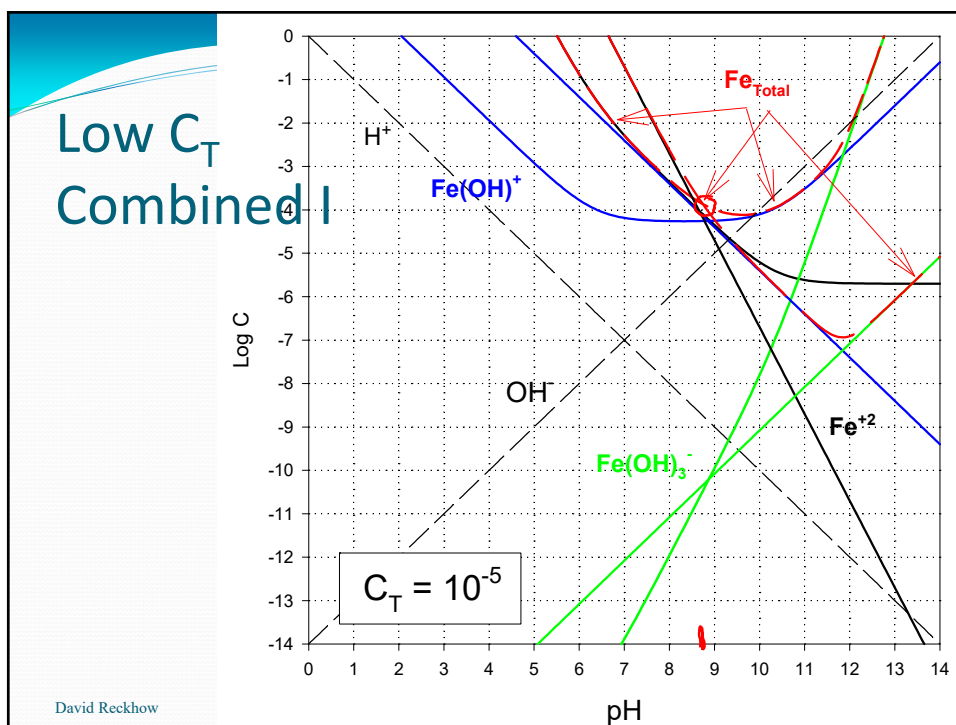
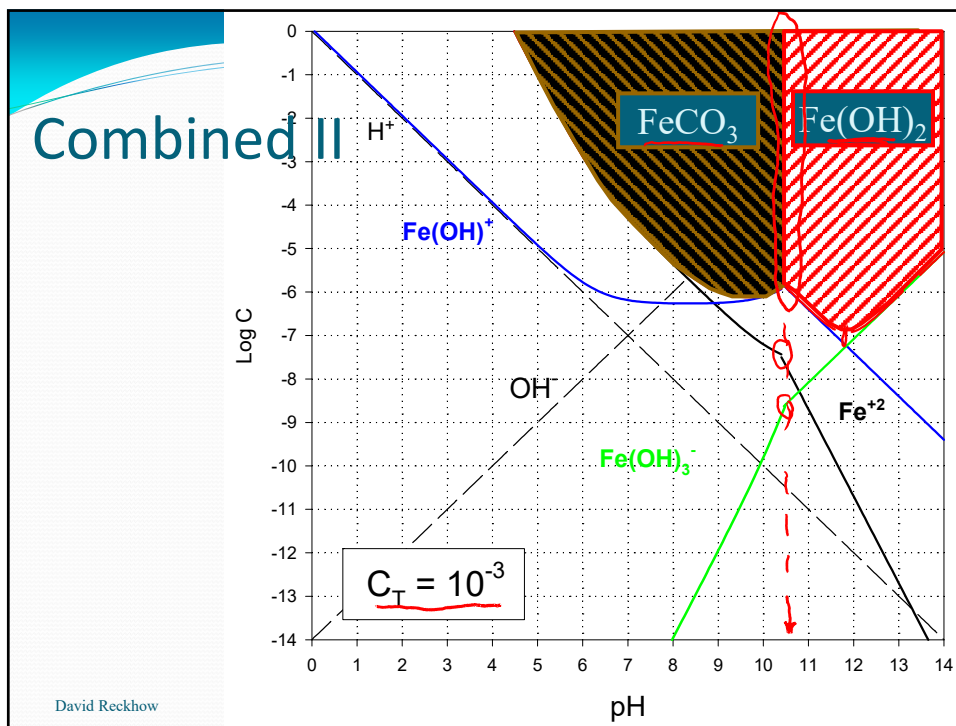
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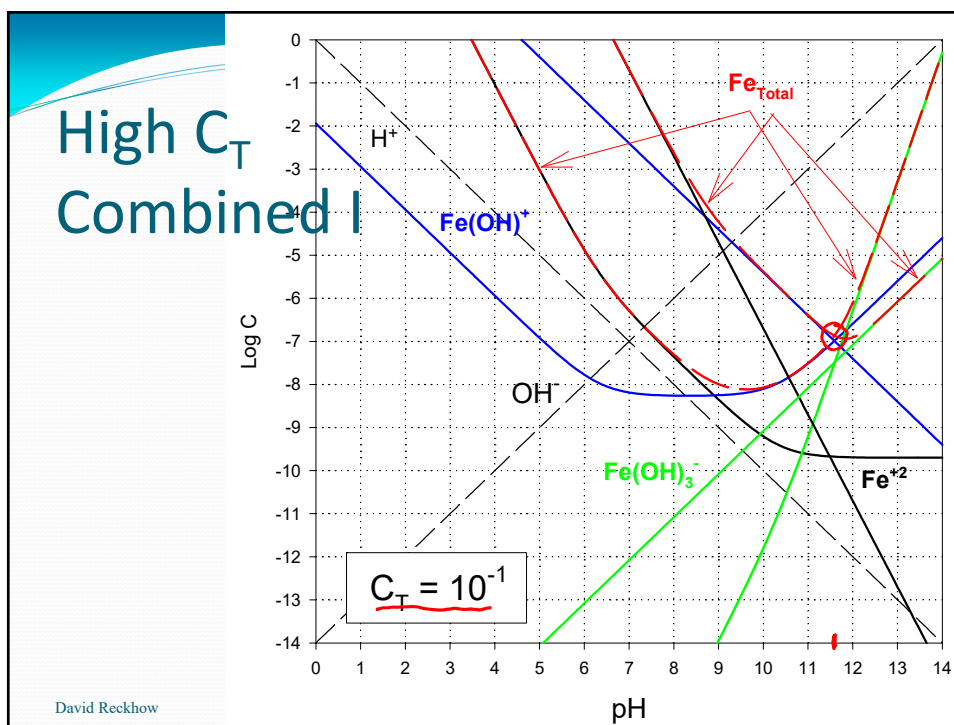
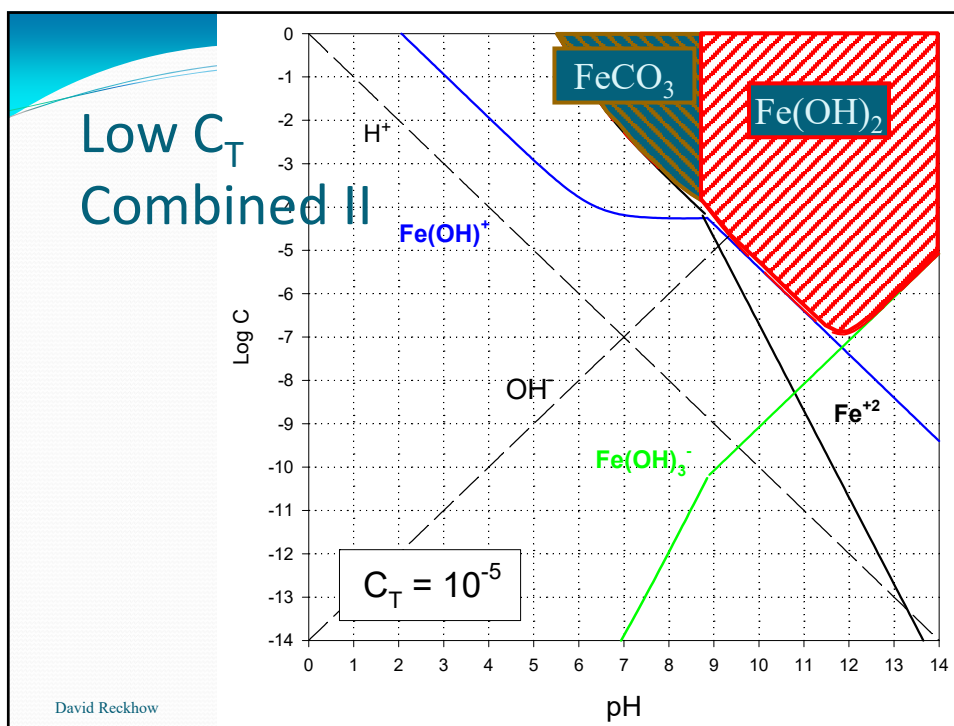


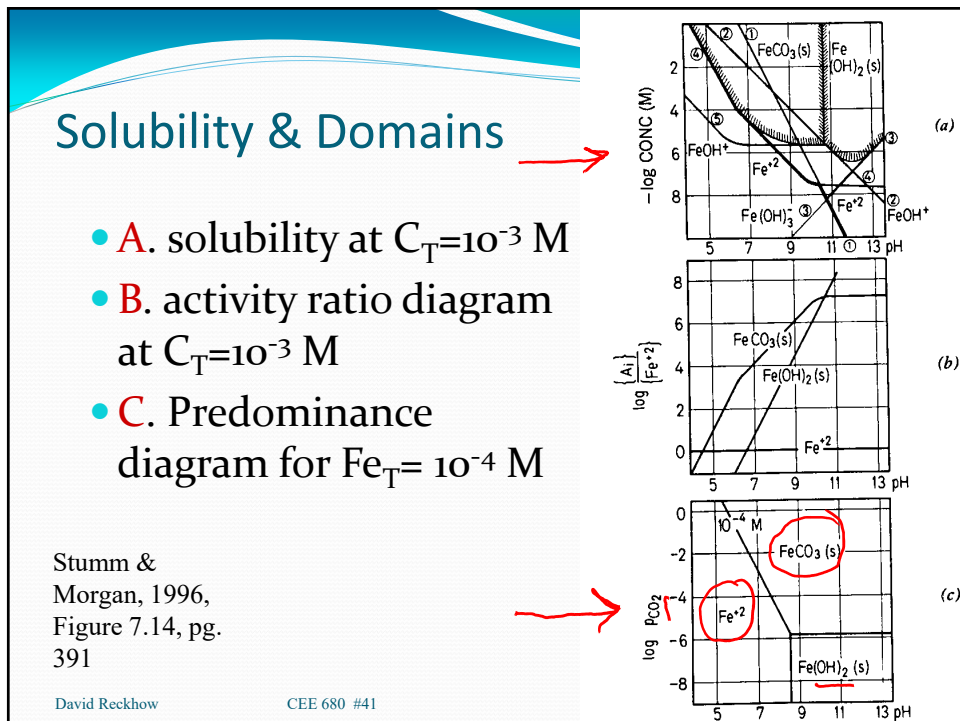
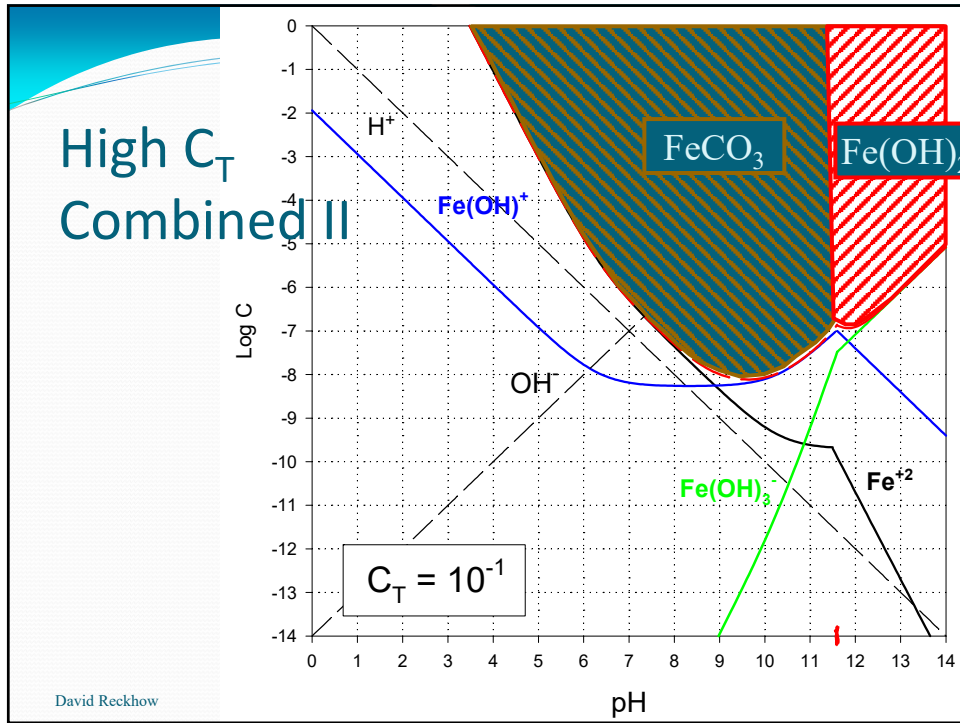















- To next lecture

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