Size Effects on Sorption of Nanomaterials to Iron Oxides

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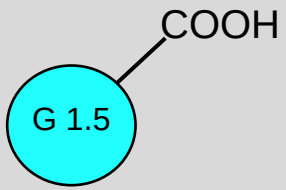
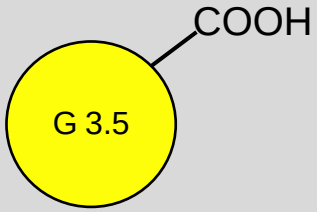
Introduction & Experimental Setup

Generation 1.5 PAMAM

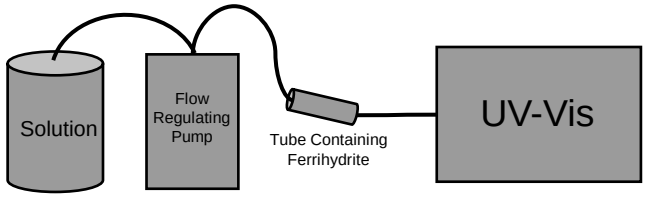


⌀= 2.9 nm

Generation 3.5 PAMAM

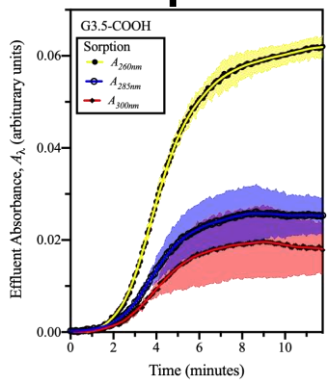


⌀=4.5 nm

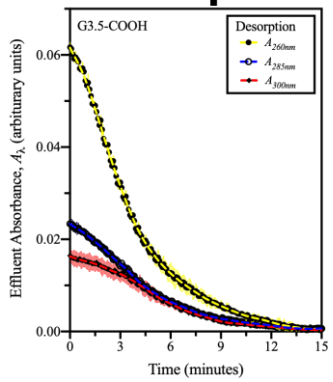


- Number of carboxylic groups were held constant
- All experiments were run at pH 5
- Effluent absorbance was monitored using UV-Vis

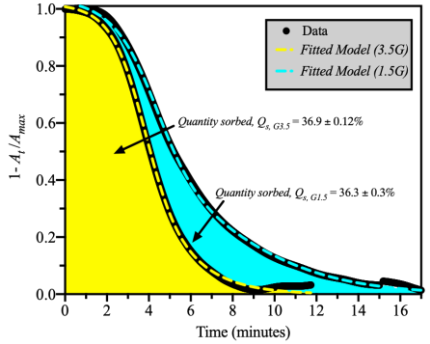
Sorption

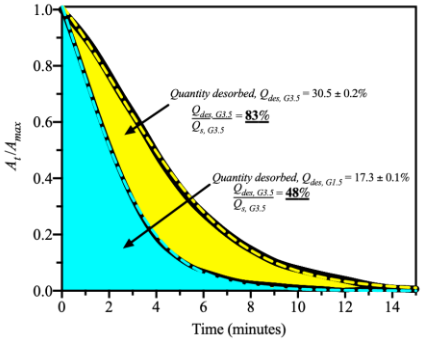


Desorption



All three wavelengths show the same trend





$$y = \frac{S_1}{1 + e^{k_1'(t - t_{1/2,1})}} + \frac{S_2}{1 + e^{k_2'(t - t_{1/2,2})}}$$

where,

$y = 1 - A/A_{max}$

S_1 and S_2 are the fractional sorption accounted for by stage 1 and 2, respectively

k_1' and k_2', are the rate constants for stage 1 and 2, respectively

$t_{1/2,1}$ and $t_{1/2,2}$, are the half-life for stage 1 and 2, respectively

t, is overall reaction time

	Fitted Model Parameters					
	S_1	k_1' (min^{-1})	$t_{1/2,1}$ (min)	S_2	k_2' (min^{-1})	$t_{1/2,2}$ (min)
G1.5-COOH	0.57	1.04	4.37	0.43	0.37	7.54
G3.5-COOH	0.75	1.28	3.82	0.25	0.63	5.39

$$y = \frac{1}{1 + e^{k'(t - t_{1/2})}}$$

where,

$y = A/A_{max}$

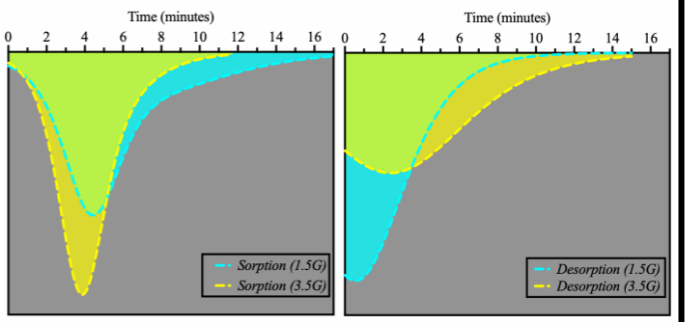
k' is the rate constant for desorption

$t_{1/2}$ is the half-life for desorption

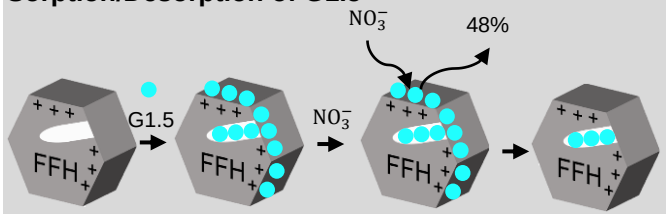
t, is overall reaction time

	Fitted Model Parameters	
	k' (min^{-1})	$t_{1/2}$ (min)
G1.5-COOH	0.596	0.54
G3.5-COOH	0.39	2.39

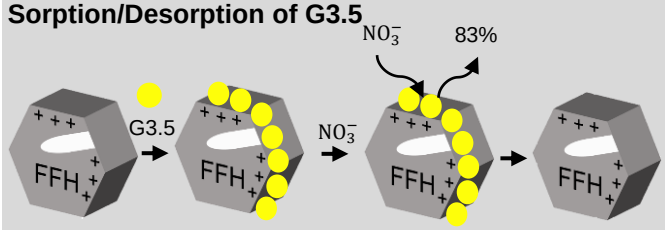
Effect of Size



Sorption/Desorption of G1.5



Sorption/Desorption of G3.5



Future Studies

- PAMAM G5.5 and PAMAM G7.5
- Varying pH
- Honors Thesis

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