Decolorization of Mineral Oils

Although the decolorization of mineral oils by porous materials is generally considered to be due to adsorption, it has not previously been shown whether the laws of adsorption are applicable. Decolorization experiments by Rogers et al. (1926)†, using a number of kinds of oils (straight-run kerosene, paraffin wax, and a naphtha solution) and several adsorbents (clays A and B), show that Freundlich's equation applies accurately, when amount of color removed is used as a measure of amount of material adsorbed.

(a) Use the equilibrium data provided in the table below, show that the Freundlich's adsorption equation can satisfactorily be applied for these sets of data.

(b) Obtain the Freundlich's equation parameters (k and n) for each set of data.

Adsorbent A	
kg adsorbent per 100 kg solution	Equilibrium color
0	263
5.0	219
10.0	189
20.0	131
22.8	120
33.3	86.5
46.8	56.5
50.0	53.3
80.0	26.2

Adsorbent B	
kg adsorbent per 100 kg solution	Equilibrium color
0	260
5.0	204
10.0	154
20.0	84
25.0	60
33.3	37
50.0	13.6

† Rogers, T.H., Grimm, F.V. and Lemmon, N.E. (1926). Adsorption Studies on the Decolorization of Mineral Oils. *Industrial & Engineering Chemistry* **18**(2), 164–169.