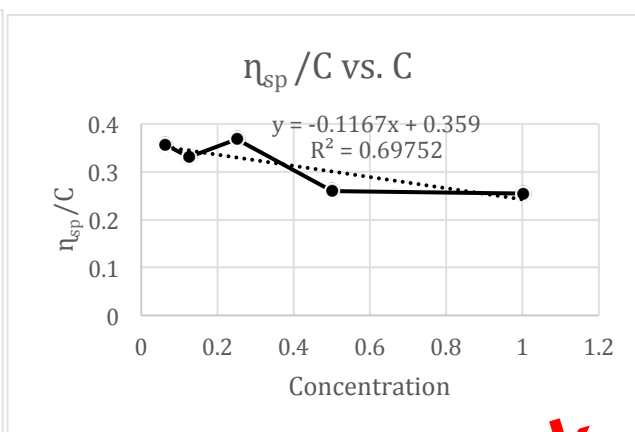
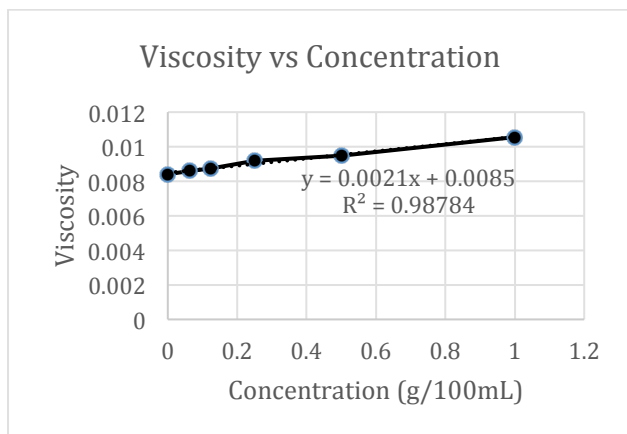


Experiment 5: Viscosity of Solutions: Molecular Weight of Dextran

I. Processed Data

Vol. of viscometer	14.0 mL	Room Temp.	27.8°C	Weight of Dextran used	1.0006g
Dextran sample code	A2	Intrinsic Viscosity	0.359		

Sample conc (wt dextran/vol)	Average Efflux Time, sec	Viscosity	Specific viscosity, η_{sp}	η_{sp}/C	Run 1	Run 2
Distilled water	233.7	0.00840	0	N/A	03:53.50	03:53.90
1.0006g/100mL	293.215	0.01054	0.25466	0.25451	04:53.63	04:52.80
0.5003g/100mL	264.11	0.009493	0.13012	0.26009	04:24.45	04:23.77
0.2502g/100mL	255.18	0.009172	0.091913	0.36736	04:14.53	04:15.83
0.1251g/100mL	243.345	0.008747	0.041271	0.32990	04:02.61	04:04.08
0.0625g/100mL	238.91	0.008587	0.022293	0.35670	03:59.21	03:58.61



II. Discussion

Dextran is polar as it dissolves in water, meaning the positive and negative areas of dextran attract the negative and positive areas of water. Water is a good solvent for dextran because it is able to expand chains of polysaccharides in the dextran. When dextran is dissolved in water, there is friction between its particles and also friction between particles and the container. This causes resistance in the flow of liquid, which then defines the viscosity.

The viscosity of water at room temperature 27.8°C, according to the textbook, is 0.00840 sq.cm/sec. The viscosity of each sample concentration in this experiment was calculated by using $n_1/n_2 = p_1t_1/p_2t_2$, wherein the efflux of water and the substance with the viscosity of water and the unknown viscosity of the sample are related. The viscosity was calculated by dividing the sample efflux time by the efflux time of water then subtracting it by 1. The viscosities divided by the sample concentrations were graphed vs the concentrations. The y-intercept (intrinsic viscosity of dextran) was determined to be 0.359. This value can be plotted against molecular weight to get the molecular weight of the unknown. The a value is 0.5000 while K is 0.000978. Using $N=KM^a$, the molecular weight was calculated to be 134,744.5436g.

III. Conclusion

The objectives in the experiment were accomplished as the intrinsic viscosity and molecular weight of dextran was determined. Based on the results, as the concentration of dextran increased, the more it is viscous; the viscosity of the sample increases as the concentration increases. The intrinsic viscosity of the dextran sample used was found to be 0.359 and the molar mass was calculated to be 134,744.5436g.

IV. Calculations

$$1) \text{Viscosity (1g/100mL)} = \frac{(\text{Viscosity of water} \times \text{time of sample})}{\text{Time of water}} = \frac{(0.00840 \times 293.215)}{233.7} = 0.01054$$

$$2) \text{Specific viscosity (1g/100mL)} = (\text{time of sample}/\text{time of H}_2\text{O}) - 1 = (293.215/233.7) - 1 = 0.2546 \text{ ratio}$$

$$3) \eta_{sp}/C = 0.25466 / 1.0006 = 0.25451$$

$$4) N=KM^a \rightarrow 0.359=0.000978(M)^{0.5000} \rightarrow M=(0.359/0.000978)^2 = 134,744.5436g$$

V. Literature Cited

"Viscosity." *Indian Academy of Science*. Web. Accessed 27 July 2014.

<http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Viscosity.pdf>