Sorption of Organic Vapors by Polymers

Finally, we investigated by (1). Next, in (2) and (3), we compared our results to the established working parameters, Bhethanabotla (4). Next, in order to check the functionality of the apparatus we also compared our results to those of Wang (2), and Wibawa (3). Finally, we investigated the effects of temperature of the bobbles and cells and added a new solvent, chloroform.

Background

Measuring the solubility of organic compounds in polymers is difficult because diffusion of molecules through polymers can be a time consuming process. A reduction in the thickness of the polymer yields faster results but makes measuring of the smaller mass more difficult. The use of a quartz crystal microbalance has proven helpful due to its sensitivity and quickness in measuring.

Objectives

The first objective was to set up the apparatus to the established working parameters, Bhethanabotla (4). Next, in order to check the functionality of the apparatus we also compared our results to those of Wang (2), and Wibawa (3). Finally, we investigated the effects of temperature of the bobbles and cells and added a new solvent, chloroform.

Approach

Using the quartz crystal microbalance allowed the solubility in a thin layer of polymer to be tested by measuring the shift $\Delta f$, between the crystal and the crystal coated with polymer. The solvent was carried through the system by nitrogen and was exposed to the polymer-coated quartz crystal that was contained within the temperature controlled cell. When equilibrium in the polymer and gas stream was reached, the additional frequency shift $\Delta f$ was noted.

After setting up the apparatus our next goal was to run it using an established set of parameters to be sure that it was accurate. Our data, shown in the graph to the right in green and yellow, clearly demonstrates a correlation to the results from previous research.

Conclusions

The data collected during this investigation can be used to strengthen the existing knowledge on solubility of solvents in polymers. Application in other fields could include filtration for environmental pollutants, identification of desired or undesired materials during fabrication, and precise sensors that could not only tell you if a substance is present but in what concentration. Further study is needed to determine the best process for coating the quartz crystals.

Referenced Resources

Bhethanabotla, V. (2015, June 22). Personal Interview


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