Quartz Crystal Microbalance/Heat Conduction Calorimetry Study of Solvent Sorption in Thin C_{60} and C_{60}-Piperazine Films

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The quartz crystal microbalance/heat conduction calorimeter (QCM/HCC) developed in our laboratory[1, 2] has been used to investigate the sorption of water and organic solvents in thin films of C_{60} and of C_{60}-piperazine monoadduct. Films of 1-5 mm thickness and 2 cm^2 area were spray-deposited on the quartz crystal microbalance surface, and were then exposed in the QCM/HCC to various partial pressures of solvent vapor in a N_2 carrier gas at 25°C. Solvents included water, methylene Chloride, toluene, and dichlorobenzenes. Simultaneous measurement of mass uptake and heat dissipation in the film at 25°C as a function of solvent partial pressure gives new information on the thermodynamics and kinetics of solvate formation in C_{60} and C_{60}-piperazine, complementing prior studies of solvate formation with differential scanning calorimetry. QCM/HCC studies also show if the solvate formation at 25°C is irreversible or if the solvate is easily decomposed at low solvent vapor pressures.

1. A. L. Smith, and H. M. Shirazi (2000). "Quartz microbalance microcalorimetry: a new method for studying polymer-solvent thermodynamics." J. of Thermal Analysis and Calorimetry 59(1-2): 171-186.
2. 2. A.L. Smith, H. M. Shirazi, and S. R. Mulligan (2002), "Water sorption isotherms and enthalpies of water sorption by lysozyme using the quartz crystal microbalance/heat conduction calorimeter", Biochimica et Biophysica Acta - Protein Structure and Molecular Enzymology, in press (available online)