# Preliminary Experiments on Induced Surface Roughness of Polymer Films in Non-Solvent Environment

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The field of polymer science involves a great deal of wet chemistry, as such the use of solvents/non-solvents when working with polymers is ubiquitous. To date there has been little investigation into the structure of an interface between a polymer and a poor solvent. The details of such an interface are highly relevant whenever polymer processing involves exposure to non-solvents. Examples could include film processing for nanolithography. Neutron reflectivity represents an ideal technique for the study of such a buried interface between polymer and non-solvent.

In order to investigate the interface we performed neutron reflectivity experiments in a custom built liquid cell. Thin film (200nm) samples of polystyrene were placed in contact with several liquids. In each case contrast was provided by selective deuteration of either the polymer or the liquid. All liquids were non-solvents for the high molecular weight polymer used in the experiments. Solvent quality was assessed through solubility experiments involving low molecular weight polystyrene. Water and n-Heptane were chosen to represent the extreme cases with water having the lowest solubility and n-Heptane the highest (while remaining a non-solvent for high molecular weights). Experiments were performed on the D3 neutron reflectometer beamline at Chalk River with a resolution of 0.001 $Å^{-1}$. Figure 1 represents the results of the experiments for both deuterated and hydrogenated polymer systems. Exposure to the varying solvent qualities produces a clear qualitative difference in the observed reflectivity profiles. Work is currently being performed to quantitatively determine the scattering length density profiles for the various systems.

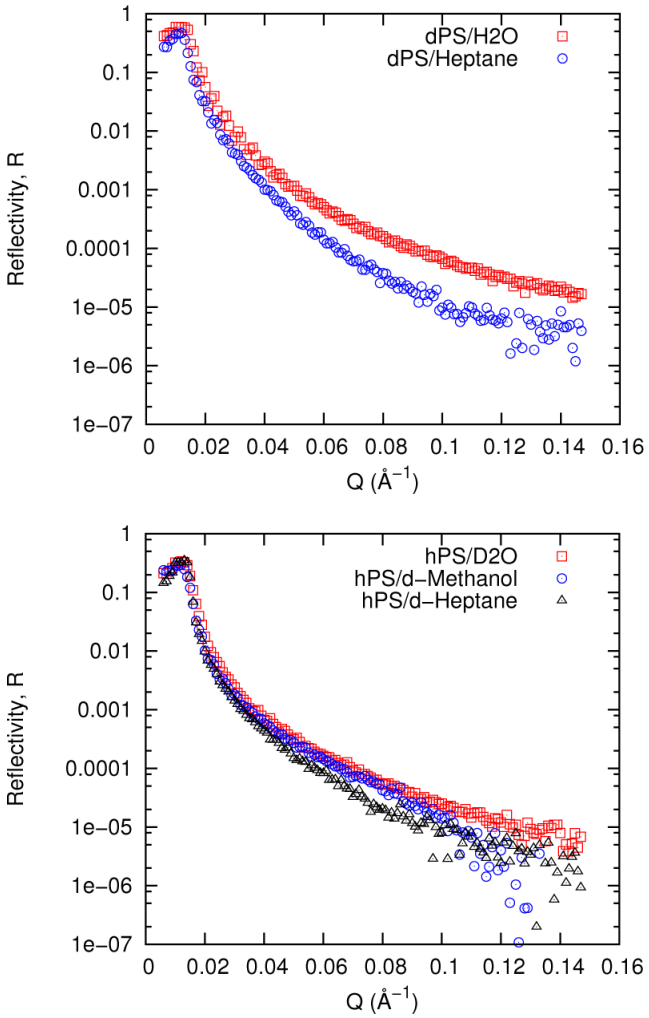


**Figure 1** Neutron reflectivity profiles for deuterated polymer/hydrogenated solvent (top) and hydrogenated polymer/deuterated solvent (bottom) systems.