

Aggregation States of Polymers at Non-solvent Interfaces by Neutron Reflectivity

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Many polymers have found a wide range of applications as functional materials in the presence of a liquid like some used as solid electrolytes and separator films for cells, liquid filtration membranes, biochips for tailor-made diagnosis, contact lenses, *etc.* In these cases, the liquid serves as a non-solvent for the polymer for the obvious reason not to dissolve the polymer. For a better understanding about how the design and construction of these highly-functionalized materials could be improved, the aggregation states and physical properties of such polymers at the “non-solvent” interfaces should be systematically studied. In this study, the aggregation states of polystyrene (PS) thin films at interfaces with non-solvents such as water, methanol and hexane were examined by specular neutron reflectivity in conjunction with sum-frequency generation vibrational spectroscopy [1]. The density profiles of the PS thin films along the direction normal to the interface with water and methanol were comparable to that in air. However, this was not the case of the film in hexane exhibiting a diffused interfacial layer due to swelling. Also, the local conformation of PS at the outermost region of the films was quite sensitive to the surrounding environment and responded consequently to a change in its environment. This was the case for typical non-solvents such as water and methanol. The extent of the conformational change is explained in terms of the interfacial energy. The results for PS will be compared with those for polymethacrylate [2] and poly(vinyl ether) [3].

References

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