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MMPM-molecular migration in polyvinyl acetate matrix: impact of compatibility, number of migrants and stress on surface and internal microstructure

Migration of small molecules to, and across the surface of polymer matrices is a little-studied problem with important industrial applications. Indeed the ability of small molecules to migrate through a polymer matrix to achieve the desired properties will impact the function of a product. It's been shown that chemical and molecular structure, surface free energies, phase behaviour, close environment and compatibility of the system, influence the migrants' motion. When differences in behaviour, such as occurrence of segregation to the surface or not, are observed it is then of crucial importance to identify and get a better understanding of the driving forces competing in the process of molecular migration. In this aim, experience is allied with theory in order to deliver a validated theoretical and computational toolkit to describe and predict the phenomena. Effects of polarity mismatch and of a second migrant (carvone, triacetin) over a first one (sorbitol) has been assessed. The surface energy of the films of different composition reveals the presence of both migrants to the surface. The influence of temperature by annealing the films shows that the molecules of the smallest molecular weight are driven to the surface. The more polarity mismatched the migrants are the more the smallest molecules are surface segregated. Surface micro-structures and self-organization of the molecules are also evidenced by atomic force microscopy and ion beam analysis supplemented by neutron reflectometry. As films under static conditions have been studied, we also wish to explore the more challenging conditions of materials under controlled strain.

Biography

Ophelie Squillace has completed her PhD from Le Mans University. She has pursued a year of Post-doctoral study in the Le Mans University to complete her work on new models of tethered membrane for biosensors applications in collaboration with INRA, Paris. She has now joined in the group of Richard Thompson at Durham University as a Postdoctoral Research Assistant.

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