STRUCTURAL FACTORS INFLUENCING THE RATE OF MIGRATION AND REORGANIZATION OF SILOXANE-CONTAINING, SURFACE-MODIFYING POLYMERIC ADDITIVES

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Siloxane-containing, surface-active ABA block copolymers (B = siloxane) were melt blended with a variety of base polymers to assess the effects of structural features on the rate of surface migration and reorganization of the (fully-developed) surface layer. The rate of surface migration in compression-molded films was monitored using water/methylene iodide contact angles to calculate solid surface tensions, which were used, in turn, to calculate diffusion coefficients for the surface modifying additives (SMA) polymers. As expected, the diffusion rates increase significantly at annealing temperatures greater than the Tg of the base polymer. The degree of surface coverage by siloxane (PSX) in air-annealed blends increased with increasing siloxane block length. In addition, the rate of copolymer diffusion/surface development increased with increasing PSX block length, even when overall SMA molecular weight was increased by the higher molecular weight PSX. Underwater annealing of air-equilibrated blends significantly increased hydrophilicity, apparently through replacement of nonpolar PSX blocks by more polar A blocks (e.g. polycaprolactone). This surface reorientation was reversible through several cycles.