DYE LEVELING IN POLY (ETHYLENE TEREPHTALATE)

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Migration of dye from darker fibers to lighter ones was quantitively studied by placing fibers dyed to equilibrium with undyed ones in a common bath, measuring dye concentrations in the fibers as a function of time. 2x, 4x e 6x fibers were heat-set and boiled before the experiment. Disperse red 15 was the dye, and 13 g/ℓ benzoic acid was used as a carrier in some of the tests. Structural measurements indicated a glass transtion temperature reduction of fibers with carrier was ineffective; it was necessary for carriers to be present in the leveling bath. In the absence of carrier, the Tg was above the dyeing temperature and diffusion and migration were very slow. Voids formed by 20°C in the presence of the carrier, with a large corresponding increase in dye diffusivity and migration rate. At long times (7-22 h) however, the diffusivity decreased because of a 4-5% increase in crystallinity. The rates of leveling correspond to the diffusivities, confirming that leveling for a given dye is controlled by polymer molecular mobility. Is was possible to reverse the carrier effect by boilding the fibers in a bath containing no carrier. Preteatment of the the previous presence of carrier, observed by small angle X-Ray scattering, tended to collapse. This resulted in migration behavior similar to fibers not exposed to benzoic acid.