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POLYMER ADHESION
CRYSTALLINITY AND SURFACE MOBILITY

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The self-adhesive properties of semicrystalline polymers put in contact at temperatures varying between T_g and T_m, were investigated by a double cantilever beam test (DCB), performed at room temperature. The study focused on the influence of two mechanisms which take place during the formation of an interface and can then transfer stress; namely chain interdiffusion, which can produce entanglements, and phenomena of fusion / crystallisation at the interface. Our model system were: polybutylene terephthalate (PBT), polybutylene isophthalate (PBI) and three random copolymers with different amounts of isophthalate comonomer leading to different degrees of crystallinity. We prepared assemblies from two plates of the same copolymer at contact temperatures varying between T_g and T_m and contact times of 10 and 30 minutes. For the copolymers with high degrees of crystallinity (~30%), adhesion decreases sharply when T_m-T increases. DSC curves show that the adhesion only becomes significant at contact temperatures above the melting temperature of the smallest crystallites. For the copolymers with low degrees of crystallinity, adhesion is significant over a wider range of temperatures. For these copolymers, it was possible to obtain amorphous polymers by quenching them from a temperature above T_m. Adhesion measured at room temperature after contact at temperatures varying above T_g, depends in that case on the competition between cold crystallization and interdiffusion kinetics. Our results show that the interface acts as a nucleating agent for crystallinity and prevents significant interdiffusion from taking place even when the bulk of the sample is amorphous. As a result it was difficult to obtain a high level of self-adhesion even from samples that were nominally amorphous.