MICROSTRUCTURE OF MICRO-INJECTION MOLDED POLYMERIC PARTS

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The use of micromolding to produce very small plastics parts is growing, due to demands by the electronics, biomedical, and other industries for such parts and for the production of components for complex electro-micro-mechanical systems. However, as a relatively new process, only limited knowledge is available regarding the detailed characteristics and dynamics of the process, the microstructure and properties of micro-molded parts, and the process-microstructure-properties relationships. Recently, we have initiated a program to study these aspects. A commercial micro-injection molding machine has been used in the study. Various materials and mold cavities were used. Data on the process variables were obtained both experimentally and based on simulation. Polarized light microscopy, atomic force microscopy, and differential scanning calorimetry were used to evaluate crystallinity and morphology. 3-dimensional distribution of shrinkage was measured using a Nikon Measurescope. Micro-mechanical properties (modulus and hardness) were measured with a Nanoindenter. Design of experiments and other methods were used to explore process-microstructure-properties relationships. The above issues and typical results will be discussed.