

# Morphology and thermal expansion in large HDPE injection moldings

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**ABSTRACT:** Morphology and linear coefficients of thermal expansion (LCTE) within the wall of a large (10 kg) injection molded container were evaluated. The study employed polarized light microscopic birefringence techniques, differential scanning calorimetry, scanning electron microscopy (SEM), as well as thermal mechanical analysis to determine the LCTE anisotropy in the skin and core of the wall. A difference in crystallinity between skin and core was found, and a region with distinct lamellas was seen under SEM without sample etching. A large variability in anisotropy of the LCTE was found in the relatively thick (~700  $\mu\text{m}$ ) skin of the molding. The LCTE differences between skin and core were attributed to molecular orientation related to resin flow. LCTE anisotropy as an important source of residual stress in the transition zone between skin and core was confirmed by fractographic analysis.

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