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Effect of Weld Lines on the Mechanical Properties of Structural Polyethylene Foams

S. Leduc and D. Rodrigue

*Department of Chemical Engineering and CERSIM, Université Laval, Québec City, G1K 7P4
Canada*

The presence of weld lines is known to substantially decrease the mechanical properties of polymer parts produced by injection molding. Unfortunately, very few reports are available for structural foams produced via chemical blowing agents. In this study, high density polyethylene (HDPE) was foamed using 0.75% azodicarbonamide under different injection conditions, namely injection speed and screw displacement. Samples without weld lines and unfoamed samples were also produced for comparison. The morphology of these sandwich structures (skin thickness and cell size distribution) was previously analyzed in order to explain their mechanical behaviour. Shear modulus from torsion rectangular tests was obtained via solid state rheology (frequency sweeps), and uniaxial tensile tests were performed to obtain the tensile modulus, tensile strength and elongation at break. As expected, density reduction and presence of weld lines both decreased mechanical properties since less material is available to sustain the applied stresses. The effect of weld lines was found to be more pronounced for foamed parts resulting from reduced skin thickness at the weld line.