

Effects of parameter changes on the structure and properties of low-density polyethylene foam

Abstract

Several parameters, such as crosslinking agent concentration, blowing agent concentration, and temperature, were varied to evaluate their effects on the structure and mechanical properties of low-density polyethylene (LDPE) foams. Dicumyl peroxide (DCP) was used as crosslinking agent, while azodicarbonamide (ADC) was utilized as the blowing agent at different levels. The formulations were prepared by using a thermostatically controlled heated two-roll mill and foamed by using a compression molding technique via a single-stage foaming process at three foaming temperatures (165, 175, and 185°C). The resultant LDPE foams were characterized and found to have a closed cell structure. The density and gel content increased proportionally with crosslinking level, whereas density decreased when ADC level and foaming temperature were increased. Another characteristic evaluated was the foam cell size decreased when the crosslinking level and foaming temperature were increased. In contrast, increasing the ADC concentration only gave a maximum cell size increase up to 6 phr that decreased when 8 phr of ADC was used. Results also indicated that compression stress increased proportionally with DCP level and decreased when ADC concentration and foaming temperature were increased. Impact studies on the prepared foams showed that their ability to absorb impact energy decreased with increasing crosslinking level, foaming temperature, and blowing agent concentration. J. VINYL ADDIT. TECHNOL., 2009. © 2009 Society of Plastics Engineers