Foaming of Poly(ethylene-co-vinyl acetate) and Poly(ethylene-co-vinyl acetate-co-carbon monoxide) and their Blends with Carbon Dioxide

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Foaming with supercritical carbon dioxide is an attractive technique to produce porous, low density polymer foams. The process often involves exposing the polymer to carbon dioxide at high pressure which is then followed by rapid depressurization to cause bubble nucleation and pore formation. In this study, we have explored foaming of poly(ethylene-co-vinyl acetate) (EVA-25) and poly(ethylene-co-vinyl acetate-co-carbon monoxide) (EVACO-2410) which are both semicrystalline rubbery materials. Their foams have wide ranging applications from footwear to medical devices. Foaming rubbery materials presents challenges in controlling bubble growth and coalescence while also preventing postfoaming shrinkage. EVA-25 and EVA-2410 blends were explored as an approach to control the dimensional stability of the foam after expansion following depressurization. Foams were generated using 1 mm thick melt extruded films of the polymers and their blends with EVACO:EVA weight ratios of 80:20, 60:40, 40:60, and 20:80. Foaming experiments were performed at 100, 200, and 300 bar and 30, 40, 50, and 60 ºC. Foams were characterized with respect to their bulk density and pore morphology.