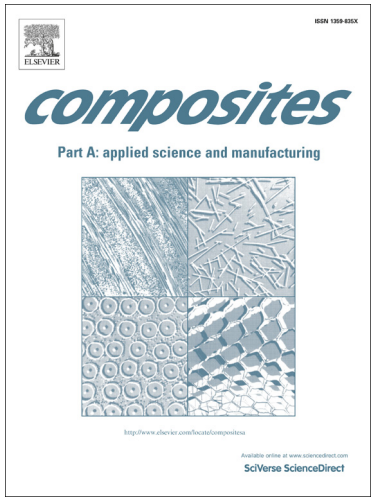

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Development of PLA/cellulosic fiber composite foams using injection molding: crystallization and foaming behaviors

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Abstract

Poly(lactic acid) (PLA) and northern bleached softwood kraft (NBSK) or black spruce medium density fiberboard (MDF) fibers were melt compounded using a co-rotating twin screw extruder and subsequently microcellular injection molded. Poly(ethlylene glycol) (PEG) was used as a lubricant. The microcellular structure, thermal properties, and crystallization behaviors were characterized using scanning electron microscopy, thermogravimetric analysis, differential scanning calorimetry, and wide angle X-ray diffraction. Results show that cellulosic fibers, acting as crystal nucleating agents, increased the crystallization temperature and the crystallinity and decreased the crystallization half time. The dissolved N_2, the shear stress, and biaxial stretching during foaming also enhanced the crystallinity of PLA. Compared to PLA/PEG, a finer and more uniform cell structure was achieved in the cellulosic fiber composite foams. The improved foam morphology was attributed to the cell nucleating effects of the fibers and the increased melt strength by the addition of cellulosic fibers and by the gas- and fiber- induced crystallization.

Keywords:

Poly(lactic acid), Cellulosic fiber, Crystallization, Foaming