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BIO-BASED POLY (BUTYLENE SUCCINATE) FOAMING BY MICROCELLULAR INJECTION-MOLDING: EFFECT OF N2 SOLUBILITY ON CELL MORPHOLOGY

Nazim Ykhlef[1] and **Eric Lafranche**[2]
[1]IMT Lille Douai, France
[2]Universite de Lille, Lille, France

Polymer foams, especially those based on biodegradable polymers, are in high demand because they remain the best solution to durably reduce the environmental footprint. During the foaming process of polymers, the gas dissolution is one of the key physicochemical parameter that determines the foam quality. In this work, the effect of nitrogen dissolution in a bio-based polybutylene succinate (PBS) foamed by microcellular injection molding has been investigated. Low molecular weight PBS (LM-PBS) was melt-blended as additives to linear PBS (L-PBS) and branched PBS (B-PBS). LM-PBS was first produced by a hydrolysis reaction of a commercial PBS at 80°C (with kinetic monitoring of the molecular weight) prior melt-blending by twin-screw extrusion into commercial PBS. Foam morphologies were subsequently characterized by scanning electron microscopy coupled to image analysis and the effect of the LM-PBS on rheological properties has been also identified in order to establish correlations between cell morphology (size and density) and shear/elongational viscosities. Interestingly, our results showed smaller cell size and higher cell density for the blends containing the LM-PBS. Lower viscosities are observed and our trends are in apparent contradiction with classical results in field of polymer foaming. In conclusion, better cell structure can be achieved despite lower viscosities. The impact of N2 solubility on cell nucleation is finally discussed based on various experiments. The as-developed approach consequently represents an elegant way to tune and optimize foam morphologies by microcellular injection molding.

nazim.ykhlef@imt-lille-douai.fr