Name of project: Foaming behavior of immiscible polymer blends in a gas assisted foam injection molding process

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Foam injection molding (FIM) is generally regarded as a versatile process for manufacturing low-density, lightweight cellular plastics and composites which offers benefits such as high-dimensional stability with relatively rapid manufacturing cycles. In this process, an inert gas, such as carbon dioxide (CO2) or nitrogen (N2), is mixed with the polymer melt to make a homogeneous melt/gas mixture prior to the injection. This single-phase mixture is then injected into the mold cavity, where the foaming and shaping takes place. The cell nucleation mechanism, the final cell morphology, and the amount of obtainable void fraction are highly dependent on the solubility of the gas with the matrix polymer. The studies on the foaming behavior of immiscible polymer blends is rare in the literature. In this project, the effect of difference in the gas solubility of different polymers on the foaming characteristics of the blends will be investigated. Binary amorphous/amorphous, amorphous/crystalline, and crystalline/crystalline polymer blends will be chosen to systematically examine the foaming characteristics. It is expected that some novel foam structures can be generated through controlling the gas localization in the mixtures.