

# Micromolecular Materials and Engineering

## Foamability and special applications of microcellular thermoplastic polymers: A review on recent advances and future direction

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### Abstract

Foaming of thermoplastics is an area of significant research interest. The substitution of any solid polymer with its foamed counterparts not only results in the lowering of material and fuel consumption but also enhances the scope of tailoring of properties for new applications. The key to manufacturing a useful foam is to achieve the desired morphology and volume expansion ratio as per the product requirements. In addition, other properties may become important, depending on the applications. Open-cell structure, biocompatibility, biodegradability, and cytocompatibility are required in scaffolds. The ease with which a polymeric material can be foamed to achieve the desired properties depends on material characteristics, processing conditions, and the blowing agent. This article reviews key literature related to factors affecting foamability and ways of enhancing the foamability of various polymeric materials. Other highlights of this review include studies on degradation kinetics of biodegradable foams, special morphology development for scaffolds, packaging, and acoustic applications as well as cell seeding studies in scaffolds. In summary, this review is expected to provide direction for future developments in the field of microcellular processing to advance the technology and applications of thermoplastic foams as sustainable materials.