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Foaming of Polymers with Supercritical Fluids and Perspectives on the Current Knowledge Gaps and Challenges

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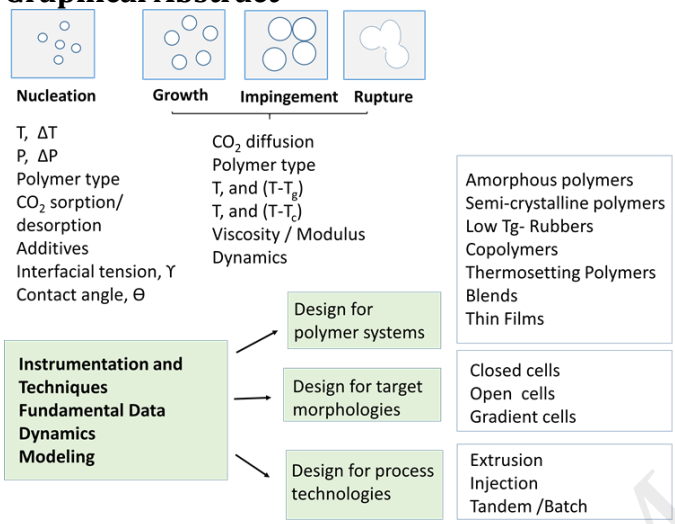
Graphical Abstract



Highlights

- Current state of polymer foaming with supercritical carbon dioxide
- Foaming of rubbers, copolymers, blends, thermosetting polymers
- Challenges in assessment of thermal transitions and rheological properties of polymers in CO2
- Challenges in modeling of foaming, scale up and processing

Abstract

In this paper, we examine the state of the art of the physical foaming of polymers with supercritical fluids with a primary focus on carbon dioxide. We provide a critical analysis of the current research pathways and the main scientific open questions. We discuss the knowledge gaps along with technological challenges for further advances. Perspectives on foaming of amorphous and semi crystalline polymers, polymer blends, copolymers, and thermosetting polymers are presented. Challenges pertaining to improved understanding of nucleation phenomena, limitations on modeling and processing methodologies are discussed.