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Supercritical Carbon Dioxide Assisted Processing of Silica/PMMA Nanocomposite Foams[1] DENIZ RENDE, LINDA S. SCHADLER, RAHMI OZISIK, Rensselaer Polytechnic Institute — Polymer nanocomposite foams receive considerable attention in both scientific and industrial communities. These structures are defined as closed or open cells (pores) surrounded by bulk material and are widely observed in nature in the form of bone structure, sponge, corals and natural cork. Inspired by these materials, polymer nanocomposite foams are widely used in advanced applications, such as bone scaffolds, food packaging and transportation materials due to their lightweight and enhanced mechanical, thermal, and electrical properties compared to bulk polymer foams. The presence of the nanosized fillers facilitates heterogeneous bubble nucleation as a result, the number of bubbles increases while the average bubble size decreases. Therefore, the foam morphology can be controlled by the size, concentration, and surface chemistry of the nanofiller. In the current study, we used supercritical carbon dioxide as a foaming agent for silica/poly(methyl methacrylate), PMMA, foams. The silica nanoparticles were chemically modified by fluoroalkane chains to make them CO_2-philic. The surface coverage was controlled via tethering density, and the effect of silica surface coverage and concentration on foam morphology was investigated through scanning electron microscopy and image processing. Results indicated that nanofiller concentration and filler surface chemistry (CO_2-philicity) had tremendous effect on foam morphology but surface coverage did not have any effect.

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