Control of Microcellular Structure in Polymeric Foams via Nanofiller Size and Surface Chemistry\textsuperscript{1} KEREM GOREN, LINDA SCHADLER, RAHMI OZISIK, Rensselaer Polytechnic Institute — Polymeric foams are used in many applications, where thermal insulation, selective sound inhibition or low density materials are needed. They are generally produced by blending polymer with a chemical blowing agent, which releases inert gas at processing temperatures. There are two major drawbacks to this process: chemical residues that form during the decomposition of blowing agent and formation of large (macroscopic) pores that weaken the material. To overcome these drawbacks, supercritical carbon dioxide (scCO\textsubscript{2}) is used. Use of scCO\textsubscript{2} along with nanofillers provide heterogeneous nucleation, and present the opportunity to control pore size and pore distribution.

In the current study, the effect of silica size and silica-scCO\textsubscript{2} interaction on microcellular structure was investigated. Two different silica fillers were synthesized: 15 and 150 nm. These silica nanofillers were surface modified with tridecafluoro-1,1,2,2-tetrahydrooctyl triethoxysilanes. Dynamic Light Scattering, FT-IR, TGA, and SEM were used to characterize the samples. Results indicate that there is a strong correlation between surface chemistry, and hence scCO\textsubscript{2} and filler interaction on pore size and size distribution.

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