Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Control of Microcellular Structure in Polymeric Foams via Nanofiller Size and Surface Chemistry[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 (scCO2) is used. Use of scCO2 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-scCO2 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 scCO2 and filler interaction on pore size and size distribution.

[1]This material is based upon work supported by the National Science Foundation under Grant CMMI-0500324.

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Date submitted: 27 Nov 2007 Electronic form version 1.4