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Novel Route to Nanoparticle Dispersion Using Supercritical Carbon Dioxide[1] RAHMI OZISIK, KUMIN YANG, Rensselaer Polytechnic Institute — An experimental study was carried out to determine the effects of supercritical carbon dioxide ($scCO_2$) on the dispersion of untreated and modified alumina nanoparticles in polystyrene. For the untreated alumina, the sudden expansion of the carbon dioxide did not alter the size of the agglomerates. This was probably caused by the weak interaction of $scCO_2$ with the untreated alumina that keep the agglomerate intact upon depressurization. On the other hand, the large agglomerates of the modified alumina showed signs of catastrophic fragmentation. It is speculated that the smaller agglomerates lacked the surface coating, which may have lead to their intact structure. The fluorinated modifiers used had a high degree of solubility with the $scCO_2$ at the processing conditions used, and therefore, the $scCO_2$ in the modified alumina composites was able to diffuse easily into the agglomerate compared to the untreated alumina. Large agglomerates can absorb more $scCO_2$ than smaller ones, and therefore, have an adequately larger bursting pressure to overcome both the hydrogen bonding between the modified alumina nanoparticles and the weak electrostatic interactions.

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