Poster GC34

Dispersion Polymerization of Methyl Methacrylate in Supercritical Carbon Dioxide using Vinyl Poly(Dimethyl Siloxane)

Patricia FRANCISCO DE OLIVEIRA[a], Ricardo ANTONIO FRANCISCO MACHADO[a], Danièle BARTH[b], Emanoelle DIZ ACOSTA[a]

[a]*LCP/EQA, Universidade Federal de Santa Catarina, Florianopolis, BRAZIL,* [b]*LRGP/ENSIC, Nancy, FRANCE*

Poly(methyl methacrylate), PMMA, is a widely used polymer for engineering, medical and pharmaceutical purposes. Depending on the desired final application suspension, solution, emulsion, dispersion or bulk polymerization processes can be used to obtain PMMA. Dispersion polymerizations using supercritical fluids have received considerable interest as a promising process to replace traditional methods for certain applications. This is attributed to the inertness of CO_2 as a solvent and the possibility to recover it, thus, an environmentally friendly process. Another advantage of this process is that the solvent and polymer can be easily separated. Methyl methacrylate is soluble in dense CO_2; however, the growing polymer is not. Therefore, a stabilizing agent is needed to promote a good dispersion along the reaction. Fluorinated compounds as well as some silicon based polymers have already been used for this purpose. In this work, a silicon based polymer, having a vinyl chain termination, was adopted as a stabilizing agent for the free radical dispersion polymerization of methyl methacrylate in dense CO_2. As far as we are concerned, this stabilizing agent has not yet been reported to be used for this purpose. Experiments were performed in a 100mL high pressure vessel containing the monomer methyl methacrylate, vinyl poly(dimethyl siloxane) as the stabilizer, azobisisobutyronitrile (AIBN) as the initiator, and CO_2 as the dispersion media. The reactions were performed at 16 MPa and 80°C for 240min. CO_2 feeding to the reactor is halted once the reaction conditions are reached. The resulting polymer was in accordance to similar products described in the literature, having a powder aspect. Scanning electron microscopy was used in order to evaluate the average particle size and morphology. Size exclusion chromatography was performed to measure molecular weight and its polydispersion index. RMN-H^+ was used to confirm the polymerization reaction, as well as to evaluate the presence of minor reactions and gravimetric analyses was performed to evaluate residual monomer in the final polymer. The results confirmed the validity of this procedure and of the stabilizer to produce PMMA with the expected characteristics.