Processing of polymer nanocomposite foams in supercritical CO_2

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Since the 1980s, the academic and industrial researches have a growing interest in the processing of **polymer/fillers nanocomposites** due to their excellent barrier, electrical and mechanical properties which are conferred by the unique advantages of nanoparticles such as their high surface area, aspect ratio, shape and size. More recently, the market for **lightweight materials** very present in the industry is oriented towards the development of **polymer nanocomposite foams** in order to improve the compressive properties, the mechanical strength, the surface quality, the thermal behavior and the dimensional stability of unmodified foams.

If processing parameters (temperature-pressure-soaking time-depressurization rate) have a clear impact on the foams morphology, materials parameters can also be tuned to tailor the foams structuration. The rheological properties of polymer material studied and in particular, the elongational viscoelasticity which is responsible for the structure and cell size obtained must be well characterized. For this reason, the **objective of this thesis** will focus on the introduction into the polymer matrix of chemical or physical heterogeneities is required to increase the viscosity of polymer and to limit cell growth. In order to create microcellular polymeric foams, **two pathways** will be used: **i)** the use of **different additives** to increase the melt strength of the matrix and to limit cell growth or **ii)** the addition of **organic/inorganic fillers** such as silicates, silica, metal oxides. In addition, a high interface amount and the multiplication of nucleation sites generated by the use of nanoparticles is a huge advantage.