INFLUENCE OF PREPARATION METHOD AND MOLECULAR PARAMETERS ON THE RHEOLOGY OF MODEL PEO/ LAPONITE NANOCOMPOSITES

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Model polymer nanocomposites based on geometrically well defined and protected Laponite particles dispersed in Poly(ethylene oxide) were investigated in order to improve the understanding of the filler dispersion effects on rheology by varying two experimental factors, namely preparation method and PEO matrix molecular weight. Preparation methods are divided into a solution dispersion and a melt dispersion by twin screw extrusion. The linear viscoelastic properties of the samples prepared by solution method revealed an elastic solid like behaviour at Laponite weight fractions as low as 0.1%, dramatically lower than the percolation threshold so far reported for such kind of systems. The sample preparation by melt dispersion, although leading to dispersed particles, does not achieve the same levels of modulus as compared to solution prepared mixtures. We propose a qualitative interpretation of this phenomenon, based on the mixture between a liquid and a dispersed phase of rather solid character. Further experiments using small angle X-ray scattering techniques (SAXS) show that the modulus level is not necessarily related to the height of the correlation peak characteristic of the Laponite stacks. However, for samples prepared with varying PEO matrix molecular weight the fraction of Laponite stacks decreases with increasing PEO molecular weight.