

Polypropylene – MMT clay nanocomposites: process and post-process structuring

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A unique mini-mixer, able to reproduce the intense mixing created in larger scale twin extruders but utilizing only small batches of materials, typically less than 100g, has been used to explore structuring of selected PP-clay nanocomposites in a design of experiments approach, assessing exfoliation number and degree of dispersion, and a wide range of rheological and physical properties in a study across two universities and six companies. The further effect of post-processing on the nanocomposite structures has been explored by biaxial stretching, to simulate the extensional deformations which will be experienced in stretch blow moulding and thermoforming. We aim for a fundamental understanding of the interactions between material formulation, process parameters and the microstructure and properties of polymer nanocomposites, providing generic processing information to guide nanocomposite production, and apply the understanding to the development of proof of concept applications. Results will be presented from the DOE experiments and subsequent property assessments (including morphological, dynamic rheology, mechanical and barrier properties), together with evidence of the significant effect of post-processing. We will also briefly refer to our findings from similar research into PET-clay nanocomposites, which are presented in detail in a separate paper, and initial scale-up trials.