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## Clay Dispersion using Extensional Flow Mixer for Polymer Nanocomposites

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The Extensional Flow Mixer (EFM) has been used in the plastics industry for the homogenization of polymerized products, preparation of polymer blends and incorporation of a plasticizer. Recently several attempts have been reported to use EFM for the preparation of polymeric nanocomposites (PNC) to disperse organoclay in the polymeric matrix. The EFM was usually mounted on a twin screw extruder (TSE) equipped with a gear pump (GP). The use of EFM resulted in improved dispersion and performance in case of polyamide or thermoplastic polyester. However, in case of non-polar polymers such as polypropylene and/or polystyrene, it was less successful. To improve EFM efficiency for dispersing organoclay in polymeric matrix, the flow pattern within the commercial EFM (EFM-3) was re-designed. The two mixers, EFM-3 and the re-designed EFM (EFM-N), were evaluated using a single screw extruder (SSE). Two systems were examined: (1) polyamide-6 (PA-6) with Cloisite®-15A (C15A), and (2) polypropylene (PP) with maleated-PP (PP-MA) and C15A. The compounded samples were injection molded, and then tested for the degree of dispersion, and mechanical performance (tensile, flexural, and impact). The results demonstrated superiority of EFM-N, especially for PA-6 with C15A. Of the process variables, pressure and polymer temperature in SSE+EFM-N were higher than those in SSE+EFM-3, especially for PP with PP-MA and C15A. However, the melt flow rate of PP with PP-MA and C15A in SSE+EFM-N was slightly higher than that obtained using SSE+EFM-3, even for the most severe compounding conditions. EFM-N not only promoted clay dispersion, but it also had benign effect on the polymeric matrix.