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MORPHOLOGY MODIFICATION IN NANOFILLED POLYMER BASED SYSTEMS UPON SHEAR AND ELONGATIONAL FLOW

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The flow type during processing of nanofilled polymer based systems can make significant morphology modification considering the nanofiller with different aspect ratio and the affinity between the nanoparticles and the polymer matrix. The shear flow is not able to change significantly the morphology in clay nanofilled polymer based systems, while, the elongational flow is able to modify the system morphology; it gives rise to exfoliation of intercalated tactoids and to some more intercalation of some tactiods. Beyond, the elongational flow is capable to orientate the nanoparticles along the flow direction and considering also the clay morphology modification, the final mechanical performances increase significantly than the unfilled polymer matrix. Furthermore, for a systems with pronounced affinity between the nanofiller and the matrix, some re-aggregation between the particles can be observed in the orthogonal flow direction. In MW-CNTs filled polymer systems, the elongational flow give rice to a oriented CNTs along the flow directions, as expected, and the some time CNTs bundle formation starts. The bundle CNTs formation leads to a significant increase of the mechanical performances and dimensional stability. Furthermore, the NTs loading leads to a morphology modification of the polymer matrix; for example, in MW-CNTs polyamide system, the formation of so called “shish-kebab” structure is influenced by the NTs presence and the formation of “hybrid shish-kebab”, i.e. the NTs plays a role of shish, is promoted.