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Morphology and Gas Barrier of Polystyrene-Clay Nanocomposites SERGEI NAZARENKO, School of Polymers and High Performance Materials, University of Southern Mississippi, SYED QUTUBUDDIN, Department of Chemical Engineering, Case Western Reserve University — Gas barrier of polymer clay nano-composites are often found to be substantially smaller than expected, especially in the case of exfoliated polymer clay nano-composites where the improvement of gas barrier should be especially noticeable. This fact remains a subject of great controversy and calls for fundamental understanding. Model intercalated and exfoliated polystyrene/montmorillonite (MMT) systems were prepared by in-situ polymerization method, and their oxygen barrier was examined as a function of NaMMT content and related to nano-composite morphology studied by TEM. It was shown that apparent exfoliation of mineral layers, as confirmed by WAXS, not necessary was associated with their homogeneous dispersion. Agglomerates containing 3-6 practically parallel exfoliated layers were observed instead, and this morphology was responsible for poor gas barrier. In contrast, intercalated polymer clay nanocomposites exhibited an interesting phenomenon of layer stair-case sliding leading to gas barrier properties better than expected. Gas barrier in both cases was successfully modeled by applying the Nielsen model which was modified to take into account layer agglomeration.

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