

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Structure and Morphology of Polymer/Clay Nanocomposites formed by Chaotic Smart Blending DILRU R. RATNAWEERA, DVORA PERAHIA, Chemistry Department, Clemson University, CHAITRA MAHESHA, DAVID ZUMBRUNNEN, Mechanical Engineering Department, Clemson University, MARK A. KAMPF, Appellton — The dispersion and orientation of the nano particles within polymeric matrices determine their properties. They depend on inherent characteristics such as miscibility, entropic barriers, structure of the polymer etc., and on processing conditions under which the polymer and the particles are mixed. Chaotic flow patterns have been used to define the structure and orientation on a micron length scale. In efforts to derive quantitative correlations, we carried out structural studies using X-ray, AFM and TEM on Nylon 6/modified clay nanocomposites as a function of the strength of the chaotic advection in a smart blending process. On the micron length scale, the clay particles are dispersed into multi layers, where the thickness of these sheets and the orientation and the distribution of the clay particles are controlled by the strength of the chaotic advection. On the molecular level, increasing the strength results in increase of the γ crystal form of the Nylon, a higher internal energy state, in which hydrogen bonds are formed between parallel chains. The structure on the micron level is attributed to the chaotic mixing which on the molecular level it may be attributed to the fractal nature of the process.

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Date submitted: 25 Nov 2006

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