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Understanding the interfacial layer dynamics of polymer nanocomposites from broadband dielectric spectroscopy ROBERT CARROLL, SHIWANG CHENG, ALEXEI SOKOLOV, Univ of Tennessee, Knoxville — Polymer nanocomposites show many advanced mechanical, thermal, optical, and transport properties mainly due to the vast interfacial area between the polymer matrix and nanoparticles. Recent studies show that there is an interfacial polymer layer with structure and dynamics that are different from the bulk polymer, and that contributes to the advanced macroscopic properties. It has been shown that broadband dielectric spectroscopy provides good method to study the interfacial dynamics in nanocomposites. However, current dielectric spectroscopy studies ignore the heterogeneous nature of polymer nanocomposites. Models based on a simple superposition of bulk polymer and interfacial layer spectra, or those that assume the interfacial layer is dynamically dead are inaccurate. In this talk, the prevailing methods in the literature will be compared with an accurate method accounting for the heterogeneity of the nanocomposites. Different nanocomposites with well-dispersed nanoparticles will be used as examples. The analysis clearly shows that the width and the amplitude of the relaxation peaks are affected by the data analysis. Thus accurate quantitative conclusions on properties and thickness of the interfacial layer can be achieved only using heterogeneous models.

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