



Contribution ID: 25

Type: not specified

Molecular dynamics at nanometric length scales

Thursday, July 9, 2015 9:00 AM (40 minutes)

The question on what length-scale molecular and especially glassy dynamics of polymers takes place is of fundamental importance and has multifold practical implications as well. Recent results based on Broadband Dielectric Spectroscopy [1,2] for nanometric thin (≥ 5 nm) layers of poly(styrene) [3], poly(methylmethacrylate) [4,5] and poly(*cis*-1,4-isoprene) [6] will be presented, delivering the concurring result that deviations from glassy dynamics of the bulk never exceed margins of ± 3 K independent of the layer thickness, the molecular weight of the polymer under study and the underlying substrate. A further exciting perspective is the measurement of the dynamics of condensed isolated polymer chains [7]. The experiments lead to the conclusions that glassy dynamics takes place on the length scale a few polymer segments (l_e ; ~ 0.5 nm) while the conformation of the chain as a whole is strongly modified due to geometrical confinement.

References

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Primary author: Prof. KREMER, Friedrich (Institute of Experimental Physics I, University of Leipzig, Germany)

Presenter: Prof. KREMER, Friedrich (Institute of Experimental Physics I, University of Leipzig, Germany)

Session Classification: Soft Matter and Glassformers

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