Learning objectives of the RPK-B Polymer Physics course.
Glass Transition in Polymers: facts and perspectives

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Glasses in general, and polymer glasses in particular, are not, perhaps surprisingly, technically solid in a crystalized form, but are substances frozen in a liquidlike structure. Many fundamental questions remain as to exactly how glasses form, transitioning from flowing liquid-like state to solid polymer glass. A central factor materials scientists study is the temperature where this occurs, the glass-transition temperature. The way – experimental, theoretical and by computer simulations – to get the information about this temperature, is the main subject of the lecture. The main learning goals can be summarized as follows.

The RPK participants at the end of this RPK day should be able to

1. Understand the basic experimental ways of measuring the polymer glass-transition temperature.
2. Understand the terminology, specificity of and basic models and theoretical approaches for polymer glass transition.
3. Discuss the main effects caused by the glass transition onto the (heterogeneous) polymer segmental relaxation.
4. Understand the abilities of the modern dynamic computer simulations in reproducing the experimental findings, and explain the intrinsic differences.
5. Suggest and critically discuss the explanations of the confinement effects on the polymer glass transition temperature.
6. Apply the acquired knowledge to interpret the simulation glass-transition-related results produced by the available software packages.

References:

1. M. Rubinstein, R. Colby, Polymer Physics § 1.5, § 8.7
2. M.P. Allen, D.J. Tildesley, Computer Simulation of Liquids, § 3
3. K. Binder, J. Baschnagel, W. Paul, *Glass transition of polymer melts: test of theoretical concepts by computer simulation*, Prog. Polym. Sci. 28 (2003) 115–172
4. G. McKenna, Glass Formation and Glassy Behaviour, , In: Comprehensive Polymer Science,Vol.2, Polymer Properties, ed. by C. Booth and C. Price, Pergamon,Oxford(1989) , p. 311.