Influence of Plasticizer on Glass Transition of Systems Showing a Rigid Amorphous Fraction (Semicrystalline Polymers, Polymer Nano-Composites)

A. Sargsyan[1,S], S. Thomas[2] and S. Thomas[2], A. Wurm[1], A. Tonoyan[3] and C. Schick[1,C]

[1]*Institute of Physics, University of Rostock, Rostock, Germany*
christoph.schick@uni-rostock.de

[2]*School of Chemical Sciences, Mahatma Gandhi University, India*

[3]*Department of Chemistry, State Engineering University of Armenia, Armenia*

Semicrystalline polymers as well as polymer inorganic hybrids often show significantly smaller relaxation strength at glass transition than expected from the non-crystalline fraction. This observation could be explained by the introduction of a rigid amorphous fraction (RAF) which contributes neither to the heat of fusion or X-ray crystallinity nor to the relaxation strength at glass transition. The RAF is assumed to be in a glassy state above the common glass transition temperature. The question arises if the RAF can be plasticized by common solvents and a devitrification of the RAF could be achieved at temperatures accessible without changing semicrystalline morphology for example. In order to decrease the devitrification temperature of the RAF we added solvents as plasticizers. Semicrystalline isotactic polystyrene (iPS) and a PS calcium phosphate as well as a polymethyl methacrylate silicon oxide nano-composite were used as model systems. As a result for all the glass transition of the mobile amorphous fraction (MAF) was lowered as generally expected. A thorough analysis of the PS data shows that the solvent penetrates only into the MAF while the RAF is not affected by the solvent.