PULSED-LASER INITIATED POLYMERIZATION: A TOOL TO UNDERSTAND THE POLYMERIZATION IN AQUEOUS SOLUTIONS

Igor Lacík

Polymer Institution of the Slovak Academy of Sciences, 845 41 Bratislava, Slovakia

The understanding of radical polymerization is closely associated with availability of individual rate coefficients. The accurate rate coefficients became available after introducing the pulsed-laser polymerization (PLP) techniques [1], in which radical bursts control the polymerization process and enable to isolate the propagation, termination and transfer rate coefficients from the reaction scheme.

This contribution will highlight recent progress achieved in understanding the radical polymerization in aqueous solutions for non-ionized and ionized water-soluble monomers by applying the PLP techniques, predominantly focusing on the propagation rate coefficient, k_p. The non-ionized monomers (e.g. acrylic and methacrylic acid, acrylamide, *N*-vinylpyrrolidone) exhibit a decrease in k_p upon increasing the monomer concentration that is proposed to be a result of intermolecular interactions between the transition state structure and solvent consisting of monomer and water [2]. The radical polymerization in water is further complicated by electrostatic repulsive interactions present in the polymerization of ionized monomers. As recently demonstrated for cationically charged monomers, k_p values linearly depend on the molar concentration of counterions [3]. The availability of individual rate coefficients has enabled to adequately describe the mechanism of polymerization and to model a number of these systems with respect to obtained conversion and molar mass distributions [4].

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