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The Influence of Monomer Type on the Initiation Efficiency in ATRP Polymerization Initiated from Silica Nanoparticles

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Extended Abstract

Hybrid materials consisting of polymers grafted onto the surfaces of the inorganic particles, play very important role in various fields of science and technology.(1) One of the most common methods used for the synthesis of such structures is Surface Initiated Atom Transfer Radical Polymerization SI-ATRP.(2)

The ATRP reaction is mediated by the equilibrium between the propagating radicals and dormant species and catalyzed by various redox active transition metal complexes.

However, when the polymerization is performed from the multifunctional initiators, such as nanoparticles, the control over the reaction becomes more challenging, mostly due to the gelation caused by the interparticle radical termination reactions. The process of crosslinking can be suppressed (or avoided) by using high dilution, addition of deactivator at the beginning of the reaction, or compartmentalization of the system, leading to the enhanced polymerization control. Nevertheless, it is challenging to obtain the high initiation efficiency in grafting from the particles surface also due the steric constraints which define the space available for single chains on the surface. It is assumed high specific volume of monomer units could eventually limit the number of polymer chains grown from the particle surface

Herein, the initiation efficiency for ATRP initiated from the silica particles is reported for different types of monomers, with the variable monomer specific volume, including styrene and several methacrylates.

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