BIFUNCTIONAL ATRP INITIATORS FOR THE SYNTHESIS OF α,ω-DICHLOROPOLYSTYRENE: NEW FUNCTIONALITIES AND THERMAL STABILITY STUDY

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Abstract

Atom Transfer Radical Polymerization (ATRP) allows to obtain living polymers with a well-defined molecular weight distribution, as well as control over topology, composition, and functionality, enabling to develop advanced materials for specific applications[1]. Functional groups can be introduced into the polymer by post-functionalization of the halogenated chain-end moieties, or on the alkyl residue of the initiator, or by direct introduction of punctually functionalized (co)monomers – greatly enhancing the targetable applications[1,2]. In addition, the desired functional group can also be carried by the ATRP initiator, provided that the functionality is impervious to radical reactions. For example, some authors explored the use of initiators containing hydrolysis- or heat-sensitive functionalities such that the final polymer exhibits self-healing properties.[3] Thermoplastics, like polystyrene, require thermal and thermomechanical stability under extrusion conditions (150-220°C) in order to be reprocessed. Therefore, it is important that the initiator employed is also thermally stable, otherwise there would be a reduction in chain length and consequently a loss of telechelecity. Unfortunately, the aliphatic halide esters typically employed as initiators have shown poor thermal stability.[4] Thus, in this study we demonstrate the enhanced thermal stability of α,ω-dichloropolystyrene synthetized via ARGET ATRP (**Figure 1**) using a novel bifunctional benzamide-containing initiator instead of the formerly reported aliphatic esters. Emphasis was placed on investigating the reason why the structure and functionality of the initiator improved thermal stability.

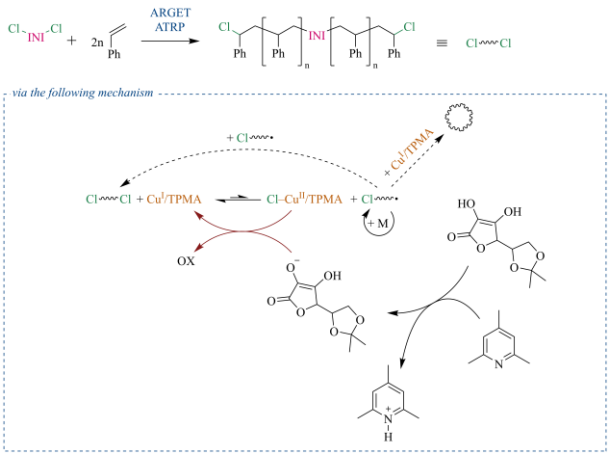

Figure 1 – Mechanism of ARGET ATRP of styrene

References

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