Synthesis and Functions of Dense Triazole Polymers

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Copper(I)-catalyzed azide-alkyne cycloaddition (CuAAC) yields 1,4-disubstituted 1,2,3-triazoles from azides and alkynes in the presence of copper(I) compounds. Recently, we have been focusing on dense 1,2,3-triazole polymers as new functional polymers, which are synthesized by CuAAC polymerization of 3-azido-1-propyne (AP) derivatives. The dense 1,2,3-triazole polymer of AP is insoluble in common organic solvents presumably because of strong dipole–dipole interactions of the dense 1,2,3-triazole backbone. Thus, we synthesized a new AP derivative, *t*-butyl 4-azido-5-hexynoate (tBuAH), which has a *t*-butyl (tBu) ester side chain, and polymerized by CuAAC to yield a dense 1,2,3-triazole polymer which is soluble in many organic solvents. tBuAH can be utilized for synthesis of stereoregular and sequence-controlled polymers because of the following features: (1) tBuAH possesses a chiral carbon at the 4-position, and the R- and S-isomers can be prepared by asymmetric reduction. (2) The tBu ester of tBuAH can be converted to 4-azido-5-hexynoic acid (AH) derivatives carrying various side chains. (3) Precursors of AH derivatives carrying a hydroxyl group, i.e., the precursor of azide residue, and a silyl-protecting group on the alkyne, can be used for stepwise CuAAC. In this paper, we will review four generations of dense 1,2,3-triazole polymers we have synthesized recently (Figure 1) [1-8].

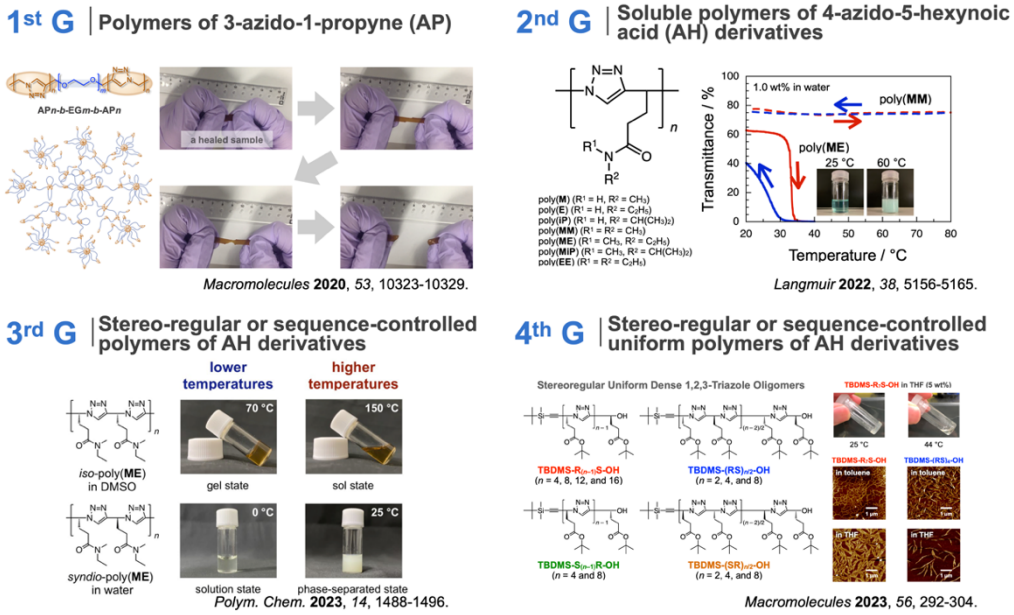

Figure 1. Four generations of dense 1,2,3-triazole polymers.

References

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