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Synthesis of polyimide macromolecules of different topological structures in "active" medium

Alexander Kuznetso [1]

[1]Enikolpov Institute of synthetic polymer materials Russian Academy of Sciences Russian Federation

Abstract

Review of the authors' works on the advanced synthesis of polyimides (PIs)- by the method of "one pot" high-temperature polycondensation in catalytic solvent - molten benzoic acid (BA). Compared to known PIs synthesis from diamines and tetracarboxylic acids dianhydrides in inert high-boiling solvents (m-cresol, nitrobenzene), synthesis in molten BA can be carried out under mild conditions (140°C, 1-2 h instead of 180-200, 3-6 h) to give completely imidized high molecular weight PIs. Due to specific mechanism, including catalysis of reversible polyamic acid moieties formation, the process proceeds as a single step irreversible reaction. The offered approach was successfully applied for obtaining linear copolyimides with controlled microstructure (from random to multiblock). Approach is useful also for synthesis of polyimide molecules of different topology including highly branched (HB) PIs (via Bn+A2 scheme), multi-arm polyimide stars with HB core (via (Bn+A2)+AB scheme], and star-shaped oligoimides (SOI) with narrow MWD and controlled average length of arms (via Bn+AB scheme). Due to presence of several reactive terminal amino groups in SOI as well as that in HBPI, the objects synthesized can be considered as chemical platform for further development of novel functional materials on their base.

Biography:

Alexander A. Kuznetsov, has a Professor (qualification degree) and Dr. Sci., degree in polymer chemistry from Enikolopov Institute of synthetic polymer materials, Russian Academy of Sciences (ISPM RAS, Moscow, Russian Federation) and Ph.D. from Karpov Physico-Chemical Institute (Moscow). Laureate of the Government of the Russian Federation. Since1998 he is a head of the Laboratory of thermostable thermoplastics of ISPM.RAS. Since 2016 - Invited professor of the Department of chemistry and technology of the Russian Technological University MIREA-RTU (Moscow). His specialty is synthesis of polyimides and other high performance polymers. He has published over 100 papers in indexed international scientific journals and made over 200 presentations at national and international scientific conferences.

Speaker Publications:

1. Alexander Kuznetsov, Anna Tsegelskaya. Synthesis of polyimides in the melt of benzoic acid,in "Solvents, ionic liquids and solvent effects"Ed by D.Glossman-Mitnik & M. Maciejewska, Intertech Open, 2020, ISBN: 978-1-78985-282-0, P.77-98, DOI: 10.5772/inertechopen.87032.
2. Kuznetsov A, Soldatova A, Tokmashev R, Tsegelskaya A, Semenova G, Shakhnes A, Abramov I. Synthesis of reactive three-arm star-shaped oligoimides with narrow molecular weight distribution J. Polym. Sci., Part A: Polym. Chem. 2018; 56:2004–2009. DOI: 10.1002/pola.29088
3. Tsegelskaya A, Soldatova A, Semenova G, Dutov M, Abramov I, Kuznetsov A. Onestage high temperature catalytic synthesis of star-shaped oligoimides by (B4+AB) scheme. Polymer Science, Series B. 2019; 61(2):148-154. DOI: 10.1134/S1560090419010123

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