New approaches to the synthesis of polyacrylonitrile: anionic polymerization and copolymerization of acrylonitrile by the action of new initiators

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It is shown that the interaction products of ethylene oxide and bicyclic amines containing tertiary nitrogen atoms in the top of the bicyclic structure are effective initiators for anionic polymerization of acrylonitrile. Unlike all known initiators of anionic polymerization of acrylonitrile, these initiators do not contain atoms of elements heavier than oxygen and do not contain the metal atoms. Polymerization of acrylonitrile under the action of the system ethylene oxide-bicyclic amine in the polar solvent (dimethyl sulfoxide) at room temperature proceeds homogeneously within a few minutes, in the slightly polar solvent (tetrahydrofuran) it proceeds heterogeneously, within a few hours. The reaction can be carried out homogeneously in a mixture of these solvents both at room and at lower temperature. The resulting polymers have number-average molecular weights s between 25·100 to 480·100 and their polydispersity index is from 1.55 to ~ 3.4 depending on the polymerization conditions. It is also shown that it is possible to obtain copolymers of acrylonitrile with oxygen-containing monomers of acrylate series, as well as with ethylene oxide.

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