Full Paper _____ *Thematic Section:* Preparative Research.
Reference Object Identifier – ROI: jbc-02/18-53-1-148 *Subsection:* Organic Chemistry.
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
The article is published based on the materials of the 2nd stage of the Mini-Symposium "Butlerov Heritage – 17-18" (Kazan)
Submitted on January 20, 2018.

Electrophilic sulfidation in the olygo(arylene sulfide)s synthesis

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Keywords: olygo(arylene sulfide)s, elemental sulfur, aluminum chloride, electrophilic substitution, benzene, thiophenol.

Abstract

Olygo(arilene sulfide)s (OAS) performance characteristics determine the prospects of their structural material use. This is a chemical resistance at high temperatures, strength, incombustibility, reliability and safety. In contrast to the traditional method for the arylene sulfides preparation by the reaction of halogenated derivatives with Na_2S (nucleophilic substitution), the amount of waste decreases with electrophilic sulfidation of aromatic hydrocarbons, since the leaving group in the latter case is the hydrogen atom of the aromatic nucleus. In addition, the synthesis of olygo(aryl sulfide)s by the electrophilic sulfidation reaction based on an available raw material the elemental sulfur is reasonable both economically and environmentally. This is due to the low cost of the reagent (1500-3000 rubles/t in Russia) as well as the need to utilize surplus in the Russian Federation sulfur, to be formed in large quantities in sulfur-containing refinery waste and associated nonferrous metallurgy products processing (up to 98% of its total production).

The olygo(arylene sulfide)s were synthesized by the electrophilic sulfidation of the aromatic nuclei in the presence of $AlCl_3$; its characteristics were determined by the synthesis conditions. By IR-, NMR-spectroscopy, mass-spectrometry it was showed the tiiliration followed by the phenylene sulfide units intramolecular cyclization.

It was found that the thiophenol tiiliration proceeds due to the sulfur arene homocondensation under the influence of $AlCl_3$ to form the ring-chain structure olygomers. It may proceed in the absence of the elemental sulfur.

The interaction of aromatic hydrocarbons with elemental sulfur in the presence of a Lewis acid was shown to allow the obtaining products with a wide range of solubility properties (9.8-99.0% in benzene) and softening temperatures (from 80 to 610 °C and higher).

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