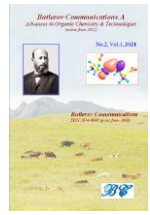
BUTLEROV HERITAGE

Butlerov Communications A
Advances in Organic Chemistry & Technologies
ISSN 2074-0948 (print)

2021. Vol.1, No.2, Id.12.
Journal Homepage: https://a-journal.butlerov.com/



Thematic section: Studies of New Technologies.
Subsection: Polymer Technology and Processing.

Review

The Reference Object Identifier – ROI-jbc-A/21-1-2-12
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-A/21-1-2-12
Received 14 April 2021; Accepted 20 April 2021

Water-swellable rubbers: Production methods and application

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Keywords: water-swellable rubber, superabsorption polymer, hydrophilic fibers, reinforcing filler, interpenetrating polymer network, compatibilizer.

Abstract

In recent years, water-swellable rubbers (WSR) have been the subject of many scientific research and industrial programs. WSR are multifunctional composites with properties such as high elasticity, tensile strength and tear resistance, and the ability to expand in volume upon contact with liquid.

Various rubbers are used for the production of WSR: nitrile rubber and its hydrogenated analogs, chlorohydrin, isoprene, both natural and synthetic, chloroprene and silicone. The most commonly used hydrosorption polymers for mixing with a rubber matrix are (co) polymers of acrylic acid and acrylamide, polyvinyl alcohol, polyethylene oxide, starch-acrylate copolymer, carboxymethyl cellulose, etc. Physical and chemical methods of their manufacture can be used to produce WSR. Each method has its own advantages and disadvantages. For example, it is easier and more cost effective to use physical methods to obtain WSR, but the lack of dispersion of the ingredients and the high times required are serious limitations. Chemical methods are relatively fast and allow improving the miscibility of polymers, but lead to an increase in the cost of the resulting products. The main disadvantages of water-swellable rubbers are the incompatibility between the hydrophilic polymer and the hydrophobic rubber and the uneven water absorption of the WSR. A thorough study of the structure, properties and shortcomings of WSR, methods of using reinforcing fillers, combiners, or binding agents will make it possible to determine the most effective ways of modifying hydrophobic polymers in order to give them the required properties.

This article reviews a review of the scientific and patent literature on the fundamental aspects of obtaining WSR: various approaches to their synthesis, properties of the corresponding polymers, the principle of operation of WSR products and some examples of their application. Some critical issues and suggestions for future work aimed at modifying the WSR in order to expand their range are detailed.

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For citation: Khac Ngoc Ho, Alevtina P. Rakhmatullina, Thi Cham Dinh. Water-swellable rubbers: Production methods and application. *Butlerov Communications A.* **2021**. Vol.1, No.2, Id.12. DOI: 10.37952/ROI-jbc-A/21-1-2-12.

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