http://doi.org/10.32864/polymmattech-2023-9-3-47-54

УДК 542.06:541.64:547.1:546.273

МЕХАНОХИМИЧЕСКИЙ СИНТЕЗ ПОЛИ(ФЕНИЛБОРДИФЕНИЛСИЛОКСАНОВ)

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Поскольку соединения бора (в том числе фенилбороновая кислота) обладают биологической активностью, их введение в полимерную цепь позволит получить материалы с полезными свойствами. Например, борсодержащие полимеры можно использовать в качестве покрытий для защиты от насекомых-переносчиков различных заболеваний. Поэтому целью нашей работы было введение фрагментов фенилбороновой кислоты в полимерную силсесквиоксановую цепь.

В работе впервые изучено механохимическое взаимодействие фенилбороновой кислоты с дифенилсиландиолом. Методом механохимической активации синтезированы олигомерные фенилбордифенилсилоксаны. Показано, что в результате механохимической активации основными побочными процессами являются отрыв фенильного заместителя от атома бора, образование 1,1'-бифенила и тримеризация фенилбороновой кислоты. Дифенилдигидроксисилан в условиях механохимической активации также частично тримеризуется. Установлено, что введение фенилбороновой кислоты с небольшим количеством ацетилацетона приводит к получению олигомерного фенилбордифенилсилоксана с соотношением Si/B примерно равным 1. При этом ацетилацетон взаимодействует с гидроксильными группами фенилбороновой кислоты, защищая исходные соединения от тримеризации. Нагревание полученного преполимера приводит к дальнейшей конденсации с увеличением молекулярно-массового распределения и молекулярной массы.

Показано, что механохимическая активация исходных соединений отдельно друг от друга приводит к их тримеризации. В случае фенилбороновой кислоты происходит отрыв фенильного заместителя с образованием метаборной кислоты и 1,1'-бифенила, что подтверждает радикальный и ион-радикальный механизмы механохимической активации.

Ключевые слова: дифенилсиландиол, фенилбороновая кислота, механохимический синтез, борсилоксаны, механохимия полимеров.

MECHANOCHEMICAL SYNTHESIS OF POLY(PHENYLBORONDIPHENYLSILOXANES)

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Since boron compounds (including phenylboronic acid) are biologically active, their introduction into the polymer chain will make it possible to obtain materials with useful properties. For example, boron-containing polymers can be used as coatings to protect against insect vectors of various diseases. Therefore, the aim of our work was to introduce phenylboronic acid fragments into the polymeric silsesquioxane chain.

In this work, the mechanochemical interaction of phenylboronic acid with diphenylsilanediol was studied for the first time. Oligomeric phenylborondiphenylsiloxanes have been synthesized by mechanochemical

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activation. It has been shown that, as a result of mechanochemical activation, the main side processes are abstraction of the phenyl substituent from the boron atom, formation of 1,1'-biphenyl, and trimerization of phenylboronic acid. Diphenyldihydroxysilane under the conditions of mechanochemical activation is also partially trimerized. It has been established that the introduction of phenylboronic acid with a small amount of acetylacetone leads to the production of oligomeric phenylborondiphenylsiloxane with a Si/B ratio of about 1. In this case, acetylacetone interacts with the hydroxyl groups of phenylboronic acid, protecting the starting compounds from trimerization. Heating the resulting prepolymer leads to further condensation with an increase in molecular weight distribution and molecular weight.

It has been shown that mechanochemical activation of the starting compounds separately from each other leads to their trimerization. In the case of phenylboronic acid, the abstraction of the phenyl substituent occurs with the formation of metaboric acid and 1,1'-biphenyl, which confirms the radical and radical ion mechanisms of mechanochemical activation.

Keywords: diphenylsilanediol, phenylboronic acid, mechanochemical synthesis, borosiloxanes, mechanochemistry of polymers.

Поступила в редакцию 03.08.2023

Образец цитирования:

Либанов В. В., Капустина А. А., Шапкин Н. П. Механохимический синтез поли(фенилбордифенилсилоксанов) // Полимерные материалы и технологии. 2023. Т. 9, № 3. С. 47–54. http://doi.org/10.32864/polymmattech-2023-9-3-47-54

Citation sample:

Libanov V. V., Kapustina A. A., Shapkin N. P. Mekhanokhimicheskiy sintez poli(fenilbordifenilsiloksanov) [Mechanochemical synthesis of poly(phenylborondiphenylsiloxanes)]. *Polimernye materialy i tekhnologii* [Polymer Materials and Technologies], 2023, vol. 9, no. 3, pp. 47–54. http://doi.org/10.32864/polymmattech-2023-9-3-47-54

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