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ВОЛОКНИСТО-ПОРИСТЫЕ ПОЛИМЕРНЫЕ МАТЕРИАЛЫ ДЛЯ ФИЛЬТРАЦИИ ВОЗДУХА И ГАЗОВ (ОБЗОР)

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С ростом загрязнения воздуха и периодическими вспышками эпидемий все больше внимания уделяется устройствам фильтрации. Основными компонентами загрязняющих веществ в воздухе являются твердые частицы, жидкий аэрозоль, биоаэрозоль и газ/пар. С ростом спроса на высокопроизводительные и высокоэффективные фильтры разрабатываются новые материалы и функциональные возможности с применением передовых технологий.

Цель работы — рассмотрение полимерных волокнистых материалов (ПВМ), получаемых по двум технологиям: выдувания из расплава полимера (melt-blowing) и электропрядения (melt-spinning). Для более полного понимания процессов, лежащих в основе фильтрации, рассмотены также механизмы очистки газовых сред от примесей.

Показано, что повышения эффективности фильтрации ПВМ добиваются различными методами, в частности созданием композитных (или многослойных) фильтроэлементов и ПВМ в электретном состоянии. Электретные нетканые материалы играют все более важную роль в борьбе с загрязнением воздуха из-за их выдающихся фильтрационных характеристик и относительно низкого сопротивления фильтрации. Чаще всего хорошими электретными свойствами обладают ПВМ на основе полимерных смесей или полимеров, наполненных функциональными добавками. В заключение отмечено, что перспективы применения ПВМ в системах фильтрации связаны с использованием новых материалов, в частности биоразлагаемых, а также экологически чистых и низкоэнергозатратных технологий получения высокоэффективных фильтров.

Ключевые слова: полимерные волокнисто-пористые материалы, фильтры, эффективность фильтрации, выдувание расплава полимера, электропрядение, электретные фильтроматериалы.

FIBROUS-POROUS POLYMERIC MATERIALS FOR AIR AND GAS FILTRATION (REVIEW)

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With the increase of air pollution and periodic outbreaks of epidemics, more and more attention are paid to filtration devices. The main components of air pollutants are particulate matter, liquid aerosol, bioaerosol and gas/vapor. With the increasing demand for high-performance and high-efficiency filters, new materials and functionalities are developed using advanced technologies.

The purpose of this work is to consider polymer fibrous-porous materials (PFM) obtained using two technologies: polymer melt-blowing and melt-spinning. Mechanisms for cleaning gas environments from impurities are also considered.

It is shown that the filtration efficiency of polymeric fibrous materials is improved by various methods, particularly the creation of composite (or multilayer) filter elements and PFM in the electret state. Electret nonwovens are playing an increasingly important role in air pollution control due to their outstanding filtration

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performance and relatively low filtration resistance. Most often, good electret properties are possessed by PFM based on polymer mixtures or polymers filled with functional additives. In conclusion, it is noted that the prospects for the use of PFM in filtration systems are associated with the use of new materials, in particular biodegradable ones, as well as environmentally friendly and low-energy technologies for obtaining highly efficient filters.

Keywords: polymer fibrous-porous materials, filters, filtration efficiency, polymer melt blowing, electrospinning, electret filter materials.

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