

Electrospun polyvinyl chloride/poly (butyl methacrylate-*co*-butyl acrylate) fibrous mat for absorption of organic matters

Naiku Xu¹ · Jipeng Cao² · Yuyao Lu¹

Received: 26 June 2015 / Accepted: 22 January 2016 / Published online: 13 February 2016
© Iran Polymer and Petrochemical Institute 2016

Abstract Polyvinyl chloride (PVC) is a hydrophobic and lipophilic polymer, and its electrospun mat has plenty of micro- and nanopores. However, the PVC electrospun mat cannot absorb organic substances due to its weak fiber-web structure. The copolymer of butyl methacrylate (BMA) and butyl acrylate (BA) has very good electrospinnability, and its electrospun fibers can construct a firm fiber-web structure through many bonded nodes. However, there are few micro- and nanopores in the fiber-web of the copolymer of BMA and BA since the electrospun fibers of the copolymer of BMA and BA can cohere with each other. Therefore, the copolymer of BMA and BA was blended with PVC in *N,N*-dimethylformamide to provide their electrospun fibrous mat with good fiber-web structure and many micro- and nanopores, and their electrospun fibrous mat was then used as an absorbent of organic substances in this work. We first discovered the electrospinnable concentrations for PVC solution, the solution of the copolymer of BMA and BA, and the blend solution of PVC and the copolymer of BMA and BA by researching the characteristics of these solutions, and we analyzed the effect of the electrospinnability of PVC in the blend solution on the formation of fiber-web structure. Then, the blend solution with an electrospinnable concentration was electrospun into fibrous mat, and its surface characteristics and absorption capability to organic

matters were subsequently investigated. The correlation between absorption capability and fiber-web structure was analyzed through field emission scanning electron microscope. The result showed that the blend solution of PVC and the copolymer of BMA and BA had better electrospinnability in comparison with PVC solution, and the corresponding fibrous mat had a great potential application in removing organic matters since it owned better hydrophobic and lipophilic properties than the fibrous mat electrospun from PVC solution or the solution of the copolymer of BMA and BA.

Keywords Polyvinyl chloride · Poly(butyl methacrylate-*co*-butyl acrylate) · Blend solution · Electrospinning · Absorbent of organic substances

Introduction

With the fast development of modern industries including petrochemical, organic chemicals, surface coating, packaging, and printing, a large quantity of organic matters have been generated. The organic matters by intentional and unintentional release have polluted water resources during their application and production [1, 2]. The water polluted by organic matters can do great harm to human beings' health since organic matters are usually poisonous, thus the released organic matters must be removed from the water to make the water useful to human being and solve the problem of water shortage.

Some absorbents have the capability to absorb organic matters, thus absorption treatment has been considered as an effective method to remedy the water pollution caused by organic matters [3, 4]. In this instance, organic matters absorbent has attracted the attention of international

✉ Jipeng Cao
cjp_2014@163.com

¹ State Key Laboratory of Separation Membranes and Membrane Processes, School of Material Science and Engineering, Tianjin Polytechnic University, Tianjin 300387, China

² Liaoning Key Laboratory of Functional Textile Materials, School of Clothing and Textiles, Eastern Liaoning University, Dandong 118003, China