Functionality Investigation of New Skin-care Finishing Agent

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1. INTRODUCTION

Environmental technology (ET) is already one of the most important technology area throughout the world and the demand of environmental friendly and biocompatible products are continuously increasing. Also in textile industry, lots of functional eco products such as antimicrobial, deodorization, skin aging and atopy prevention, and moisturizing are continuously developed and introduced.

Phospholipid polymer known as lipidure consists of hydrophilic phosphoric acid parts and hydrophobic lipid parts forming fats. It was already verified that they have functions of moisturizing, anti skin aging, antimicrobial and excellent stability since they have similar structures to cell membrane.

In this study, new biocompatible muti-functional textile finishing agents based on phospholipid 2-ethacryloyloxyethyl phosphorylcholine (MPCE) copolymer was synthesized and polymerized with biocompatible derivates. Synthesized polymers were prepared as textile finishing agent with various conditions, and applied to synthetic fiber. MPCE treated textiles were investigated their biocompatible functionality, such as hygroscopic property, wetting property, anti-static property, anti-bacterial effect and skin irritation activity. From this study, not only fuctionality of phospholipid polymers were verified, but also important information for preparing and application to finishing agent for textile was provided.

2. EXPERIMENTAL

2.1 Synthesis of MPCE polymer

MPCE was prepared by synthesis of 2-hydroxyethyl methacrylate (HEMA), triethyl amine (TEA) and 2-chloro-2-oxo-1,3,2-dioxaphopholane (COP), and synthesized MPCE was polymerized with HEMA or N-isopropyl acrylamide (NIPAM).

2.2 Formulation

At first, MPCE polymer and Tween20 (surfactant) were placed in water at concentration of 1%, and solution was controlled to pH 4 by dropping acetic acid. After the mixture was homogenized using ultra sonificator, Lyoprint PBA(binder) and Hydrophobol XAN(cross-linking agnet) were added to solution at concentration of each 1% and 0.3%, and then mixture was homogenized. In the finishing agent prepared by above process, precipitate was not generated since stabilization of emulsion and dispersion, and hygroscopic and anti-static property were increased.

2.3 Property measurement

Biocompatible functionality of MPCE treated textile was evaluated by measurement of moisture regain, wetting test, frictional static charge, anti-bacterial effect and skin irritation activity. Measured polymers were MPCE homopolymer and copolymer which were polymerized by varying monomers and polymerization ratio, and numbered 1 to 8.

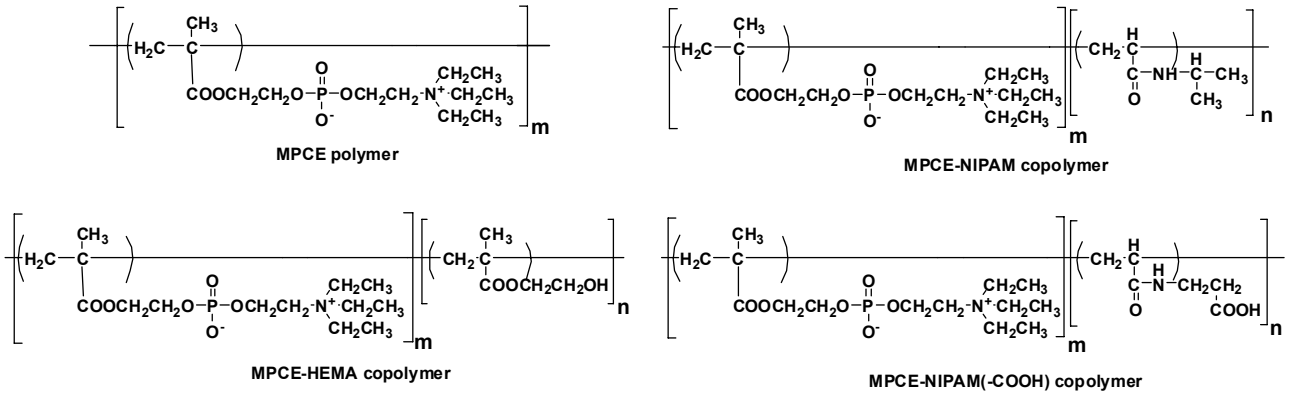

Fig. 1. The structure of MPCE polymer

3. RESULTS

Following data were indicated that biocompatible functionality such as as hygroscopic property, wetting property, anti-static property, and anti-bacterial effect was increased by MPCE treatment. Also, from single-dose patch test, it had not skin irritation activity. Especially, results of comparing before and after washing, it is indicated that MPCE treatment had good durability.

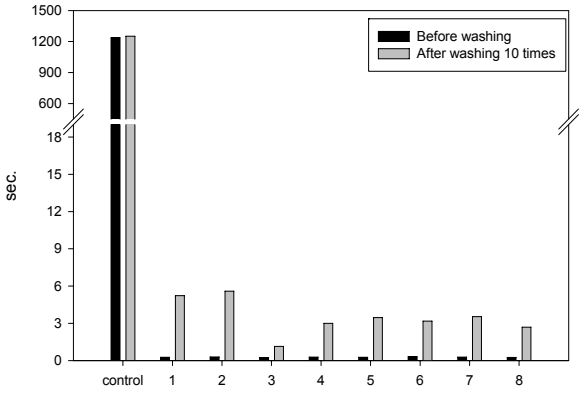

Fig. 2. Wetting test of MPCE treated textile.

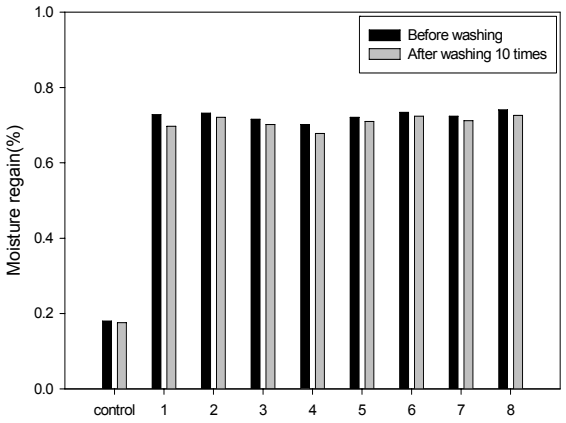

Fig. 3. Moisture regain of MPCE treated textile

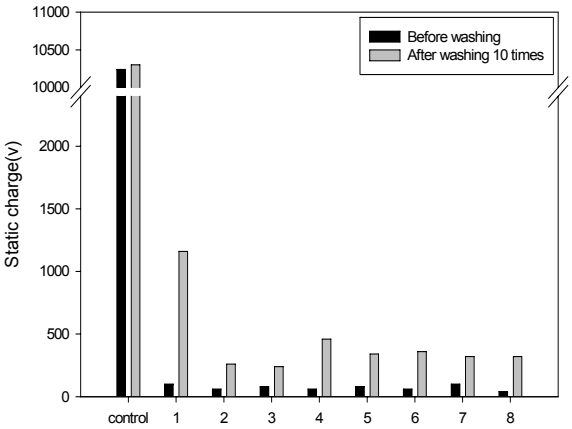

Fig. 4. Static charge of MPCE treated textile.

Table 2. Anti-bacterial test

Sample	ATCC 6538		
	0 h	18 h	Percentage of removal
Control	2.3×10^4	3.9×10^6	-
MPCE	2.3×10^4	<10	99.9
MPCE-HEMA	2.3×10^4	<10	99.9
MPCE-NIPAM	2.3×10^4	<10	99.9
MPCE-NIPAM (-COOH)	2.3×10^4	<10	99.9

4. REFERENCE

[1] K. Ishihara, T. Ueda, and N. Nakabayashi; Preparation of Phospholipid Polymers and Their Properties as Polymer Hydrogel Membranes, J. Polymer, 20(5), 355-360(1990)

Table 1. Skin irritation activity by single-dose patch test

	Test subject A (male)	Test subject B (female)
After 30min from removal	C 1 2 3 4	C 1 2 3 4
After 24hr from removal	C 1 2 3 4	C 1 2 3 4