

EVALUATION OF CELLULOSE DERIVATIVES GELS FOR WOUND HEALING DRESSING

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KEY WORDS

Polysaccharides, oxycellulose, hydroxyethylcellulose, carboxymethylcellulose, wound healing, surface coatings, human skin, gels

Introduction

At the present time the importance of lowering the total costs per capita on post traumatic recovery is a driving force for intensive materials research oriented on surface coatings and different tissue regeneration vehicles. Both synthetic as well as the natural biopolymer systems are used. Our aim is the study of the polysaccharide based tissue recovery enhancement devices due to their both healing as well as anti-inflammatory effects. One of the possible applications seems to be cosmetics and wound healing dressings.

Skin is the human body's largest organ. Skin has many functions, which are essential for life. It helps to regulate body temperature, forms the natural barrier against the action of physical, chemical and bacterial agents from surrounding or it is the part of the system respiratory. How is sketched out, the skin is very important for our living. On this account it must be insured against the reactive agents from surrounding environment and also against insults by serious emergency.

Unfortunately the skin is often seriously injured during car accidents, burnt up by fire or electricity, etc. Many times these are very heavy injuries with far-reaching consequences. These are effected by problems during healing. The physical, chemical and bacterial agents influence process of healing, they make it slower and not so effective. The results are tedious treatment, cicatrix, burn scars, etc.

On that account an interest to make the healing process more effective is such enormous. A special tools and methods of the treatment are developed. Synthetic as well as natural polysaccharides are biocompatible with human skin. Both have positive effect on wound healing. They protect the wound against bacteria, physical and chemical processes from surrounding environment and help to speed up the healing process.

Our aim is to produce special plasters from biomaterials, polysaccharides. These plasters will be applied on the injury in a liquid form. By the medium cross-linking, liquid will form a very thin film. This film will protect the wound against aggravating factors from surrounding atmosphere. It will speed up the healing process and conserve the wound.

Experimental

Materials and methods:

Oxycellulose (OK CEL) was obtained from Synthesia, Pardubice, Czech Republic.

Hydroxyethylcellulose (HEC) was obtained from Hercules, Aqualon Division, Alizay, France. The type 250LR, lot A-0749 with the technical name NATROSOL[®] was used. Molecular weight of Natrosol 250LR was 9×10^4 Da.

Carboxymethylcellulose (CMC) was obtained from Hercules, Aqualon Division, in Alizay, France. Refined CMC type 7L, lot 20075 with the technical name BLANOSE[®] was used. Molecular weight of Natrosol 250LR was 3×10^5 Da.

Dynamic contact angles of wetting, surface tension and density measurements were performed on Tensiometer K12 (Krüss, Germany).

Zeta potential and particle size distribution measurements were performed in a quartz cells (optical width of 10 mm) on laser-Doppler electrophoretic instrument ZetaPlus (Brookhaven Instruments Corporation, USA) equipped with a Kevlar electrode holder. At first, the instrument was set to work in the particle size measuring mode, where the mean particle size and particle distribution function were determined by means of dynamic light scattering technique using the built in correlator BI-9000 AT (Brookhaven Instruments Corporation, USA) working in homodyne detection mode. Then the instrument was switched into the zeta potential measurement mode.

Results and discussion

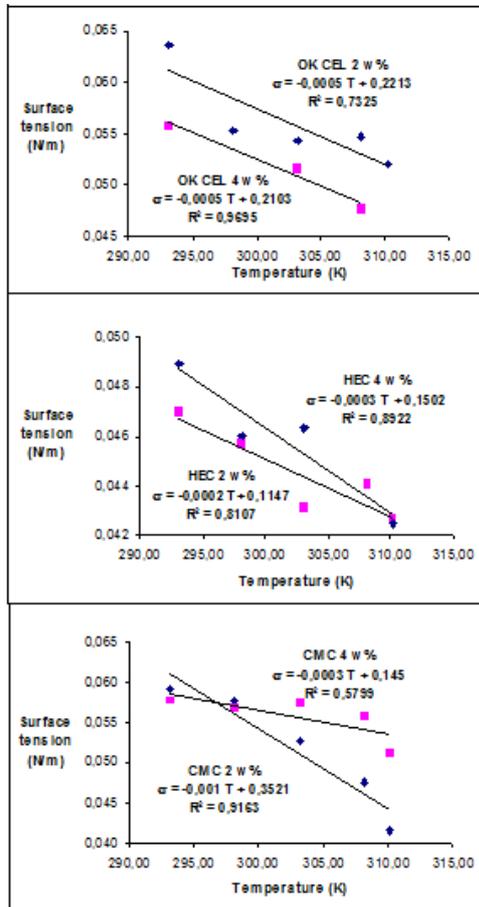


Fig. 1. Temperature dependence of the surface tension of studied aqueous biopolymer solutions.

Tab. 1. Values of temperature dependence of density for two different weight concentrations of each cellulose sample.

	OK CEL 2 w%	OK CEL 4 w%	HEC 2 w%	HEC 4 w%	CMC 2 w%	CMC 4 w%
Temperature	Density					
T	ρ					
(°C)	(g/cm ³)					
20	1,0042	1,0215	1,0059	1,0089	1,0060	1,0133
25	1,0039	1,0097	1,0047	1,0055	1,0045	1,0119
30	1,0018	1,0073	1,0023	1,0035	1,0037	1,0090
35	1,0010	1,0055	1,0013	1,0010	1,0025	1,0084
40	0,9992	1,0046	0,9999	0,9997	1,0024	1,0070

Conclusions

There was conducted systematic basic physico-chemical characterization of selected cellulose derivatives as prospective candidates for material base suitable for applications in planar wound healing dressings.

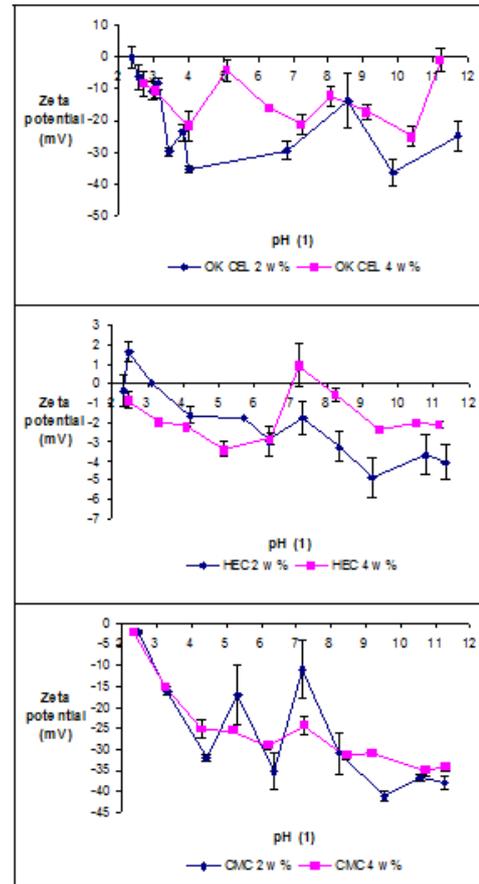


Fig. 2. pH dependence of the zeta-potential of studied aqueous solutions.

Acknowledgements

Authors would like to express their gratitude for financing of this research by Ministry of Industry and Trade of the Czech Republic (Project No. Konzorcium FD-K3/89) and to the Ministry of Education, Youth and Sports of the Czech Republic (Grant VZ MSM7088352101).

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