CELLULOSE, CELLULOSE / POLYSACCHARIDE OR CELLULOSE / PROTEIN BLEND MATERIALS PREPARED FROM A NOVEL SOLVENT SYSTEM FOR USE IN MEDICAL APPLICATIONS

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INTRODUCTION.

Current industrial methods for making cellulose membranes are relatively expensive, use toxic or dangerous solvents, and have environmental concerns regarding hazardous waste production.

EXPERIMENTAL RESULTS AND CONCLUSIONS.

A new environmentally friendly solvent system has been developed to make cellulose and cellulose blend membranes. It was determined there was a need to see if this novel system could be used for membrane production, we were successful. These membranes were produced, and they were characterized, and found to have physical properties comparable with current cellulose membranes.

We then used these results to attempt the development of blend materials, with unique properties. We developed these membranes with pure cellulose and blended with another natural biomaterial to make a composite membrane with unique properties. These compatible blends of starch or protein with cellulose had never been accomplished before. The methods of characterizing these materials are also useful in determining compatibility of polymers with one another in a solid system. We discovered these new blend materials have interesting chemical and physical characteristics, and adding these biomaterials remains compatible at the macro and micro level with cellulose. These materials were then characterized and found to have physical properties similar to conventional cellulose membranes.

ACKNOWLEDGEMENTS.

Nazarbayev University, Seed Grant and North Carolina State University research funds, NC Soy Council.

REFERENCES.

1. US Patent 4276172, Cellulosic membrane for blood dialysis.
2. Treiber E. E., in Nevell T. P., Zeronian S. H. (Eds), Cellulose Chemistry and Its Applications, (1985), pp. 457-473, Ellis Horwood, Chichester.
3. Miyamoto I., Matsuoka Y., Matsui T., Saito M., Okajima K. (1996). Polymer J., 28: 276.
4. http://www.pioneers-in-polymers.com/institute/index.php.
5. Kotek R. (2007). Regenerated Cellulose Fibers, in Handbook of Fiber Chemistry, Levin, M. (Editor), 668-762, CRC Press.
6. Frey M.W., Li L., Xiao M., Gould T. (2006). Cellulose (Dordrecht, Netherlands), 13(2): 147.
7. Lee H.J., Afshari M., Onori J., Cuculo J., Kotek R. (2007). A Novel Solvent System for Cellulose Dissolution and Spinning, American Chemical Society Meeting, Chicago, IL, USA, March 25 – 29, 2007.
8. Jik L.H. (2008). Novel Cellulose Solvent System and Dry Jet Wet Spinning of Cellulose/ED/KSCN Solutions, MS Thesis, North Carolina State University.
9. Douglass E.F. (2010). The Development of Cellulose Blend Membranes using Cellulose and other Natural Biopolymers using a Novel Solvent System. PhD Thesis.