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United States Patent [19]

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Ward et al.

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[54] **COPOLYMERS AND NON-POROUS, SEMI-PERMEABLE MEMBRANE THEREOF AND ITS USE FOR PERMEATING MOLECULES OF PREDETERMINED MOLECULAR WEIGHT RANGE**

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[21] Appl. No.: **52,361**

(List continued on next page.)

[22] Filed: **Apr. 23, 1993**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 874,336, Apr. 24, 1992, abandoned.

[51] Int. Cl.⁶ **C08G 77/04**

[52] U.S. Cl. **128/28; 528/25; 528/10; 528/34; 210/100.21; 210/500.23; 525/453; 525/459; 525/460**

[58] Field of Search **128/28, 25, 80, 34; 525/453, 459, 460; 210/500.21, 500.23**

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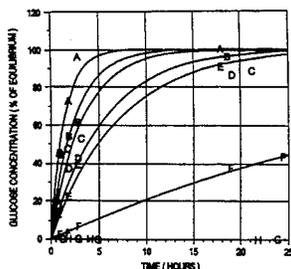
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[57] ABSTRACT

A biocompatible, hydrophilic, segmented block polyurethane copolymer which comprises 5 to 45 wt % of a hard segment and 95 to 55 wt % of a soft segment selected from a hydrophilic, hydrophobic and amphiphathic oligomer is disclosed. The copolymer is capable of forming a non-porous, semi-permeable film of a tensile strength greater than 300 and up to 10,000 psi, and has an ultimate elongation greater than 300% and up to 1,500% and a water absorption such that the sum of the volume fraction of absorbed water and the hydrophilic volume fraction of the soft segment exceeds about 100% and is up to about 2,000% of the dry polymer volume. The film is permeable to cell nutrients and waste molecules of up to about 6,000 to 600,000 molecular weight and is substantially impermeable to cells and particulate matter. A non-porous, semi-permeable, biocompatible film is formed from the block copolymer of the invention in the form of a flexible sheet or a hollow fiber. Also disclosed is a method of permeating molecules of a predetermined molecular weight range while preventing the passage of larger molecular weight molecules, cells, and condensed phases of matter between two fluids comprising interposing between the two fluids the non-porous film of the invention.

57 Claims, 3 Drawing Sheets



A	85 PERCENT
B	80 PERCENT
C	50 PERCENT
D	40 PERCENT
E	30 PERCENT
F	20 PERCENT
G	10 PERCENT
H	0 PERCENT