

Studies on Biofunctional Synthetic Membranes

- Poly(MTP-co-BMA-co-GMA) membrane-

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Polymers containing monomers with pendant phospholipid polar group, 2-(methacryloyloxy) ethyl-2-(trimethylammonium) ethyl phosphate(MTP) were synthesized and blood compatibility of the copolymers was evaluated.

Good permeability of biocomponents of molecular weight below 10^4 through cellulosic membrane coated with the copolymer of 2-(methacryloyloxy) ethyl-2-(tri-methylammonium)ethyl phosphate, butylmethacrylate(BMA), and glycidyl methacrylate(GMA) was observed, (Fig.1).

Amount of protein adsorption on polymer surface was investigated at 36.5 °C and pH 7.4 using sorption method. Protein adsorption on the surface of the MTP copolymer with phospholipid polar group was suppressed effectively. The adsorption ratio decreased with increase in the MTP composition of the MTP copolymers. There is significant difference among homopolymers, poly(BMA) and poly(VA), and high MTP composition copolymer, (Fig.2)

A large number of platelets were adhered and aggregated on the hydrophobic poly(BMA), but platelet adhesion was completely suppressed on the surface of MTP copolymers. This result could be explained by the important role of the phospholipid moiety of the polymer on blood compatibility.

The effects of the poly(MTP-co-BMA-co-GMA) membrane as a covering membrane of the biosensor on the sensitivity and responsibility of the sensor were investigated. The sensor which covered with the poly(MTP-co-BMA-co-GMA) membrane could work completely over 30 hr in the protein solution.

glucose sensor

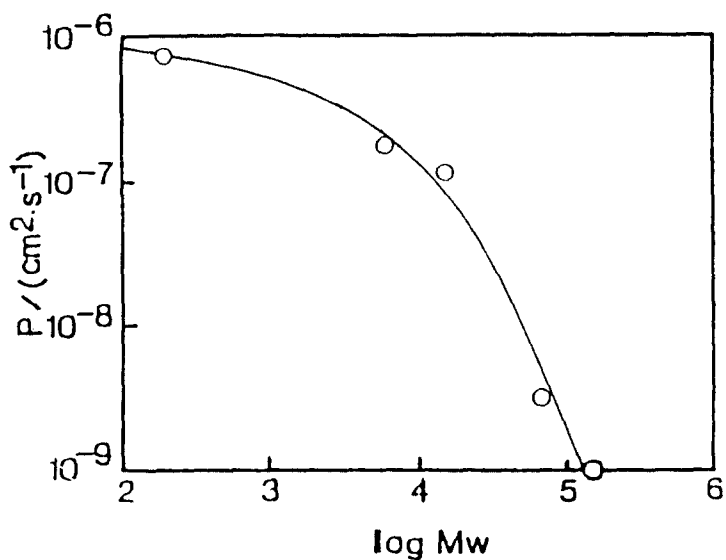


Fig.1. Relation between permeation coefficient and molecular weight in Poly(MTP-co-BMA-co-GMA)(40/55/5, mol ratio in feed) Coated cellulosic membrane at 36.5°C and pH 7.4. (Water content : 0.63; membrane thickness : 85/ μ m)

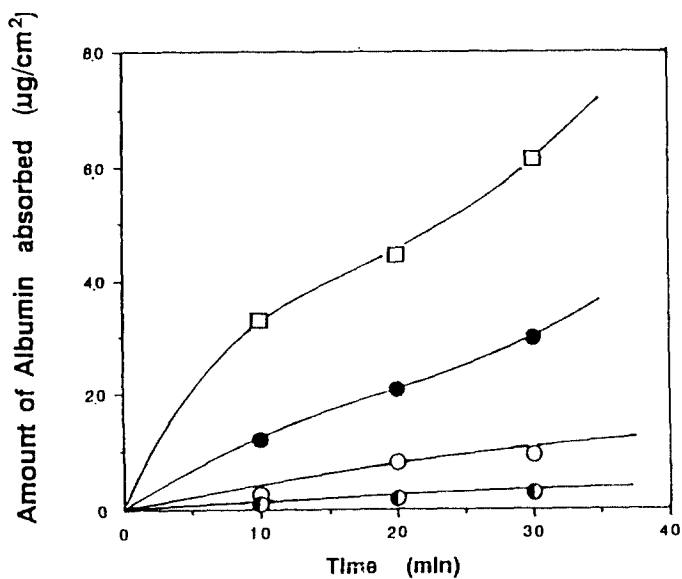


Fig.2. Adsorption of Bovin serum albumin onto polymer surface at 36.5°C and pH 7.4. Albumin concentration 4.5g/dl. □: poly(BMA), ○: poly(VA), ●: poly(MTP-co-BMA-co-GMA) (35/60/5, mol ratio in feed), ◐: poly(MTP-co-HMA-co-GMA) (40/50/5, mol ratio in feed)