

Copolymerization of HEMA with N-Containing Monomers in Order to Produce a Protein Resistant Biomaterial Surface

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INTRODUCTION: A biomaterial is a material designed to fulfill a purpose and to exist at a physiological interface without being rejected. The most important problem, in the use of most biomaterials is their biocompatibility. It is essential for an implanted device to be able to avoid physiological rejection at the biological interface to which it applied. A number of polymers are known which have a wide range of properties ranging from hard and glassy plastics, through hydrophobic rubbery materials, to soft water containing hydrogel matrices.

METHODS: In this piece of research work, three different nitrogen containing monomers (Fig. 1) were used for copolymerisation with HEMA. The polymerization was carried out as bulk polymerisation at 60° C for three days. The produced polymers were hydrated in distilled water with frequent changes for a period of two weeks. The cross-linker was 1% ethylene glycol dimethacrylate (EGDM). The quantity of protein deposited after incubation in protein solutions, was measured by U.V. at 280 nm.

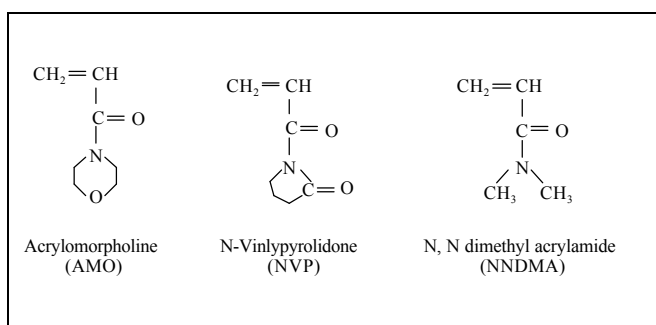


Fig. 1 The chemical structures of co- monomers.

RESULTS: A typical adsorption profile is presented in Figure 2.

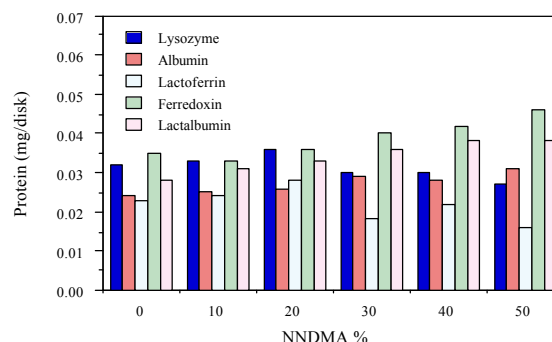


Fig.2 Protein adsorption on HEMA/NNDMA.

DISCUSSION & CONCLUSIONS: It was shown that in this case, NVP produced a copolymer that highly resist the biological environment, i.e. protein adsorption. NVP carries a high positive charge, while NNDMA has a slightly positive charge due to the mesomeric effect of the methyl groups on the nitrogen. On the other hand, AMO is a hydrophilic monomer with low positive charge. The results presented here are the mean values of three similar spoilation experiment carried out under the same conditions (\pm SD). In this case, although NNDMA has introduced some positive charge on the polymer matrix, but lysozyme (the positively charged protein, MW=14KD) shows high adsorption which may be due to its small size and compact structure.

Ferredoxine (negatively charged with molecular weight similar to lysozyme) showed the highest adsorption on this positively charged copolymer.

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