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Biomedical Polymers, Alan Rembaum and Mitchel Shen, eds., Marcel Dekker, Inc., New York (1971). 292 pages. $17.50.

Despite the great effort in recent years to develop biocompatible polymers, in particular those with nonclotting surfaces, the approach has been largely empirical. The difficulty arises from the lack of knowledge on the interaction mechanisms of blood constituents and proteins with any foreign surface. This book, a collection of papers presented in a symposium on biomedical polymers (Pasadena, California, July 1969), attempts to solve this problem with several interesting approaches. It describes polymers now being used in artificial hearts, kidneys, heart-lung machines, synthetic blood substitutes, surgical adhesives, etc., and the current interest in these areas of research.

The book can be divided into three main parts. Part (1) is a general discussion about blood-tissue interactions and the problems with applications to artificial kidneys. An excellent discussion is given on the deterioration and aggregation of red cells which subsequently lead to blood coagulation.

Part (2) consists of articles on the most promising commercial polymers and their physical properties and biocompatibility. On the whole, the polymers can be classified into two types: inert polymers, such as silicone, teflon, polyethylene, and polycarbonate, and negatively charged polymers, namely, carboxylated or sulfonated Teflon, electrets, and heparinized silicone and cellulose acetate derivatives. Considerable labor was expended in screening long-term plastic implantations and observing their physical degradation and compatibility with blood and tissue. Unfortunately, little was done to demonstrate how such interactions occurred.

Part (3) deals with potential biomedical polymers. It includes papers on opthalmological adhesives, blood-compatible polyelectrolyte complexes, polymers with ionicly bound heparin, and man-made anticlotting and antihemorrhagic polymers as drugs. The general consensus of these papers is that a very specific arrangement of negative charges on a polymer surface (i.e., similar to the space charges of heparin) is essential to inhibit blood coagulation. At the conclusion of the book is a well-written paper on "Recognition Polymer." The author argues that energy-states between pairs of protein components in a physiological environment can be roughly predicted through a set of intermolecular force functions. Based on this simple understanding, the next step is to decode the complex biological reactions where protein molecules can recognize the right counterparts and reject the wrong. To me this is a fruitful approach.

In summary, this is a good compendium and its references are up to date. As its title suggests, the book emphasizes the chemistry and behavior of biocompatible polymers. Chemical engineers who are engaged in biomaterial and bioengineering research should find it very valuable.

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