
We have attempted to represent lipid molecules and the bilayer in a new light in which the structures are accurate representations of the physical chemistry of the molecules. The objective of this effort, at the most fundamental level, is to produce a model which is a realistic guide to our thinking about the nature of the phospholipid bilayer. From crystal structure coordinates of a lipid molecule it is possible to obtain a good graphical representation of a phospholipid bilayer. Starting with the lipid dimyristoyl phosphatidylcholine, we have developed vector representations of the bilayer using the Evans and Sutherland PS 330. For high resolution raster images we have used the NRL-developed program "Amos". Once such a model is established, we soon observe aspects of bilayer structure that were otherwise obscure. Furthermore, a chemically and physically accurate bilayer model is an obligatory starting point for subsequent attempts at higher level molecular modeling. Inclusion of solvent in the model provides important guidelines to the study of other small molecules with the bilayer. Preliminary data on molecular mechanics calculations of polymerizable dioctylyphospholipid will be presented.


Double-chain amphiphilic molecules have been synthesized which contain polymerizable isocyanate groups. When these molecules are dispersed in water, closed vesicles are formed. On addition of nickel capronate, polymerization occurs of the isocyanate functions in the aggregates.

\[ \text{N=C-N} \rightarrow [\text{N-N}]= \]

This polymerization leads to enhanced stability of the vesicle system. The structures of the polymerized aggregates have been studied by various techniques, including NMR, differential scanning calorimetry, light scattering, electron microscopy, and fluorescence. Current and potential future applications of these vesicle systems will be discussed.

166. POLYMERIZED LIPOSOME AS THE CARRIER OF HEME. E. Tsuchida, H. Nishide, H. Ohno and H. Yuasa, Department of Polymer Chemistry, Waseda University, Tokyo 160, Japan.

The authors have been studying polymerized liposome as a carrier of bioactive compounds by paying attention to the hydrophobic region of the bilayer not to the inside aqueous phase, and succeeded in effectively carrying hydrophobic or amphiphilic compounds such as iron-porphyrin (heme) derivatives. It is a merit of our system that the embedded compound acts as a chemical and physicochemical probe to give informations on the bilayer structure and property of the polymerized liposome. This study is also an attempt to synthesize an artificial red blood cell. The \( 5,10,15,20\text{-d}a,a,a,a\text{-c}-[2\{2\text{-dimethyl-9\text{-}}\) 2\text{-trimethylammonioethyl\}-phosphonatoxyeicosanamido\}phenyl]porphinato iron(H) (lipid-heme) embedded in polymerized liposomes (polymerized liposomes/lipid-heme) could transport molecular oxygen effectively under physiological conditions. The stability of the liposome as the carrier of heme and the oxygen-binding ability were much improved by the polymerization of liposome.