Research Proposed

The synthesis of new materials and interplay of synthetic, measurements, applications, and theoretical researchers has been a unique and invaluable aspect of the conductive materials science area. However our understanding of the chemistry occuring in many polymerization and "doping" processes is at a very primative level. More careful chemical studies should be carried out on existing systems with close coupling to physical measurements. Modification of the synthesis and post processing of conducting polymers should be explored as well as the control of "ordering" both at the microscopic and morphological level. New synthetic techniques such as electrochemical deposition, and formulation of new kinds of composite systems as well as vacuum techniques should be explored. Attempts should be made to develop long range order in polymers. Synthetic routes to new types of materials should be vigorously studied. We must understand better how to construct new types of conductive polymer materials. In parallel with the development of new materials is a search for new properties in polymers including better control of conductivity, its absolute value and temperature dependence, stable magnetic molecular and polymeric systems, soluble and liquid conducting polymers, fast response nonlinear optical materials based on conjugated polymers, and inorganic polymer systems. In parallel with this development of new materials is a development of applied quantum chemistry that includes a better understanding of the molecular electronic structure and its relationship to macromolecular electronic structure. It is essential that there is an adequate level of manpower support as well as the requisite equipment (glove boxes, vacuum lines, GC, HPLC, crystal growing equipment etc.) for the progress of this program.

1.2 Analytical Methods

Scope

The application and increased sophistication of analytical methods in the charcterization of the structure and chemical composition of conducting materials.

Justification

New and unusual materials cannot be understood until the knowledge of what material is being studied is developed.