ORGANIC BASED SYSTEMS

Scope

Development of organic based conductive polymer systems should include aromatic, heteroaromatic and olefinic systems, and co-polymers thereof. Studies should especially focus on the development of polymerization techniques which provide high molecular weight polymers employing free radical, anionic, cationic, or metathetic processes. Emphasis should be placed on techniques which will provide polymers with known chemical structures based on the chemistry employed to prepare them. Such techniques should provide materials of high chemical purity, devoid of catalyst residues and defect structures.

Additionally, efforts should be directed toward the synthesis and development of novel dopants aimed at improving the thermal stability, environmental stability and mechanical properties of conductive systems. Novel dopant systems will include those which can be activated thermally or photochemically.

Emphasis should also be directed toward the synthesis of intrinsically conductive systems and systems which employ dopant-species as an integral part of the polymeric structure.

Justification

(1) Preparation of clean polymeric materials of known chemical composition provides a basis for careful chemical and physical studies for the development of a better theoretical understanding of conducting polymers.

(2) The formation of high molecular weight polymers will provide materials with improved electrical and physical properties eventually necessary for applications.

Status

High molecular weight polymers have now been realized for polyacetylene, polyphenylene and polyphenylene vinylene systems employing Ziegler-Natta catalysis reactions, olefin metathesis reactions and free radical processes. Likewise, high molecular weight polyheterocyclic polymers have been prepared by electrochemical polymerization. Much remains to be done on the further development of chemical and electrocatalytic polymerization techniques for the preparation of structurally diverse, highly conjugated organic systems.

Research Proposal

(1) Expand the scope of electrochemical polymerization techniques to include electrocatalytic processes.

(2) Synthesize and develop new organic structures containing functionalities capable of polymerization by free radical, cationic, anionic, and metathetic techniques which are generally applicable to the construction of a wide range of conjugated systems.