

Determination of the processability of these polymers and polymer composites, as well as the environmental stability and half life, are necessary for commercial applications. Adequate funding is necessary in order to accomplish these broad goals which includes adequate manpower as well as access to the necessary equipment. Because the techniques and skills involved are resident among different groups of scientists, it is suggested that collaborative interdisciplinary research be encouraged. In support of this, the funding mechanisms must be set up to accommodate joint proposals, interdepartmental activities, and interinstitutional activities. An important component is the funding for travel and residence in other laboratories.

#### 1.4 Theory

##### Scope

The development of a theoretical understanding that enables the induction from molecular and structural properties to the macroscopic properties of solids. The development of design criteria for preparing materials of desirable electrical, magnetic, optical and mechanical properties is an ultimate goal.

##### Justification

The development of microscopic and phenomenological theories provides a framework for understanding known properties of materials and the determination of the underlying microscopic materials parameters. An understanding on this microscopic level should allow a the prediction and/or design of new materials and their properties. The theoretical prediction of new phenomena is an important driving force for experimental study. The observation of new phenomena and anomalous behavior in turn is an important impetus for new theoretical development.

##### Status

The theoretical understanding in the field is currently at a rudimentary level. Conductive material science encompasses a broad array of problems ranging from study of molecular monomers to oligomers, to isolated chains, to chain defects (solitons, polarons, bipolarons, etc.), to crystals, to addition of disorder, to the modeling of composite systems. Development of models of the electronic structure of this broad array of systems and the prediction of their physical properties is still in an early stage.