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Preface to the Special Issue: Frontiers in Inorganic Solid-State Chemistry

The field of inorganic solid-state chemistry has always emphasized the connections between the synthesis and structure of new materials, the physical properties of the materials, and the technological advances that result from these discoveries. The three themes of *synthesis*, *structure*, and *properties* are depicted in our cover artwork. A beautiful fullerene intercalation compound is shown, which was adapted from the review by M. J. Rossiensky (University of Oxford), that illustrates the role of synthetic chemistry in the preparation of fullerides with different anion charges (p 2665). Oxides that adopt noncentrosymmetric structures are of special interest in materials science because of their important properties such as piezoelectricity and ferroelectricity. S. Halasyamani and I (Northwestern University) provided a graphical illustration from our review article that depicts the interrelationships of the noncentrosymmetric crystal classes and the properties of multifunctional inorganic solids (p 2753). Mercury cadium telluride (MCT) is an important percolation-controlled semiconductor. D. Cahen and I. Lubomirsky (Weizmann Institute of Science and the University of California—Los Angeles, respectively) show in their illustration how silver ions dope MCT p-type only when the concentration is above the percolation limit (p 2596).

The response to our call for papers from the solid-state community has been phenomenal and our special issue is comprised of more than 60 articles. About 10% are communications and the remainder are almost evenly divided between reviews and articles. Inorganic chemistry and solid-state chemistry are coupled by the intellectual and practical need to relate structure to physical properties and the chemist's talents to discover new materials. Our special issue "Frontiers in Inorganic Solid State Chemistry" explores the significant advances that have been made in recent years in the development of methods for the preparation and characterization of solid-state compounds, the exploration of structure—property relationships, and the application of inorganic solid-state chemistry in materials science and engineering. As one of the oldest and most currently active areas of interest within materials chemistry, the subject of inorganic solid-state chemistry is clearly an essential part of the foundation on which materials chemistry is based. Fundamental advances in ceramics, electronic materials, catalysts, adsorbents, superconductors, and optical and magnetic materials have enriched, and been enriched by, inorganic solid-state chemistry.

This issue is dedicated to the memory of my co-guest editor Jean Rouxel at the Institut des Matériaux de Nantes (IMN Nantes). Jean encouraged both chemists and physicists in a genuine work collaboration to pursue the hardest and most interesting problems in our field. He was well-known to most of our readers and a personal friend to many. We can only imagine the words he would have penned in writing this editorial for this special issue of *Chemistry of Materials*. I think he would have been very pleased to read these papers which include reviews on nitrides, organic templates in phosphate chemistry, low dimensional metals (one of Jean's favorite topics), the reblossoming field of manganite chemistry, electrochemical synthesis, intermetallic compounds, several papers on intercalation chemistry, and inorganic spin—gap systems with exciting new physics.

The future of inorganic solid-state chemistry is closely coupled to interdisciplinary research and the fields of materials science and engineering and solid-state physics. In this issue the reader will find papers on systems that exhibit crossover from localized to itinerant electronic behavior, novel new semiconductors, charge ordering and its relationship to antiferromagnetic and insulating properties versus ferromagnetic metallic behavior, and Mott—Hubbard insulators. These cross-disciplinary topics are only a few of the opportunities

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and challenges that exist and which will be important future research areas. In A. F. Wells' preface to his fifth edition of "*Structural Inorganic Chemistry*" he stated that "the structural side of inorganic chemistry cannot be put on a sound basis until the knowledge gained from the study of the solid state has been incorporated into chemistry as an integral part of the subject." When Jean and I discussed being co-editors we talked about this point at some length and also the need to bring together in a chemistry journal the best research results from many countries around the world. To all the authors from the United States, Europe, Israel, Canada, Taiwan, India, and Japan who responded to our invitation to publish in this special issue, we thank you for your accounts and recent results and what it is, in your own words, that makes inorganic solid-state chemistry an exciting, scientifically rich research field. *Merci Jean pour nous avoir montré la voie.*

Kenneth R. Poeppelmeier, *Guest Editor*

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