## Graphite Intercalation Compounds: Progress of Research in Japan

### Edited by S. Tanuma and H. Kamimura

*(World Science, 1985)*

During a two-year period beginning in April 1981, Japanese research on graphite intercalation compounds was organized into a "Special Distinguished Research Project" under the auspices of the Ministry of Education, Science and Culture. This functioned as an overlay to the already strong previous and continuing individual programs; more importantly, it provided support which launched many young scholars, some of whom have become major figures in the field. This book is the summary report of that two-year project. It will be of most interest to materials physicists working on graphite and other layer intercalates. There is also much of value for materials scientists in general, as an example of how different approaches, theoretical and experimental, are effectively coordinated. Industrial research managers and government program officers concerned about distinctions between "thrust areas" and individual projects will also find food for thought.

The book contains 37 articles, many of which have appeared elsewhere in longer or shorter versions. They are organized into seven chapters, each with a brief introduction and summary by the editors or other experts. The emphasis is overwhelmingly on basic physics. Electronic properties, a primary focus in Japan from the beginning, account for 40% of this volume. Another 30% is devoted to structural phase transitions and magnetism, topics that have attracted the interest of talented young researchers. Shorter chapters on carbon-13 NMR and chemical reactivity complete the presentation. Several articles document the problem, still unresolved, of reaching convergence between theory and experiment on the band structure of simple prototype compounds. Twelve papers are devoted to aspects of metal physics—quantum oscillatory phenomena, superconductivity, NMR, energy loss, etc.—many of which gave inconclusive results but will be important for those considering taking up these problems anew. The first two chapters, on phase diagrams and structural transitions, are a preview of the work which followed in 1984-1986. The book was clearly not intended as a materials science treatise; notably lacking are papers on defect morphology, electron microscopy, chemical synthesis etc. The project predates the Japanese discovery of high-quality graphite fibers via CVD, so the current work on intercalated fibers is not represented here.

The editors have done an excellent job assembling the book. The usual look of a progress report is avoided by extensive cross-referencing, and the summaries provide a critical flavor missing from conference proceedings. On the other hand, a more up-to-date picture of intercalated graphite research, Japanese and worldwide, is found in the proceedings of the 4th International Conference (May 1985, held in Tsukuba) which appeared as Volume 12 of *Synthetic Metals*. This latter volume contains important new results on angle-resolved photoemission, synchrotron x-ray scattering, theories of staging transition kinetics, neutron scattering studies of magnetic structures and phase transitions, synthesis of novel compounds with alternating magnetic and nonmagnetic, donor and acceptor intercalate layers, ternary compounds containing hydrogen, and fiber growth and intercalation—all by yet another cohort of young Japanese researchers. Even at twice the price, it would be the better choice in most cases. The volume under review does contain material not published elsewhere which will be important for newcomers, particularly those planning to try cyclotron resonance, magnetostriction, induced torque or helicon experiments. Considering the general reader on a longer time scale, its principle value is to demonstrate the effectiveness of a MITI-like approach to basic science, the best evidence of which is the dominance of Japanese research at the conference which took place two years after the project ended.

*Reviewer: John E. Fischer is professor of materials science and electrical engineering at the University of Pennsylvania.*

## Viscoelasticity — Basic Theory and Applications to Concrete Structures

### G.T. Creus

*(Springer-Verlag, 1986)*

The author has presented the basic theory of viscoelasticity and its application to time-dependent behavior of concrete in a concise, easy-to-read form. The arrangement and selection of material, along with numerous solved examples and computer listings, make it possible for a new student to understand the essential concepts quite clearly.

Chapter I deals with the basic concepts of viscoelastic behavior. Constitutive equations for a general material are derived, and special cases for elastic and viscoelastic materials are discussed. Creep and relaxation phenomena are introduced by showing experimental results. The concepts of linearity and aging are then explained, and the integral form of the constitutive equa-

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https://doi.org/10.1557/S0883769400054051 Published online by Cambridge University Press