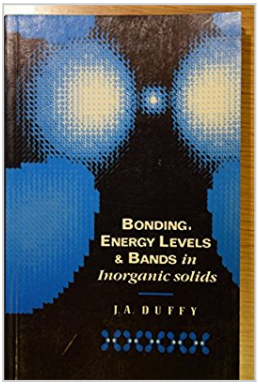

Bonding, Energy Levels and Bands in Inorganic Solids

By Jennifer A. Duffy

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Over the last two or three decades, inorganic chemistry has assumed very great importance in the development of "advanced" materials especially in thin film or vitreous form or as single crystals, where the application is predominantly in electronics and optics. To appreciate the functioning of these materials, it is necessary to understand how chemical bonding affects the energy levels of the participating atoms or ions. Confronted with the problems of chemical bonding, the chemist usually feels much more at home dealing with molecules or complex ions where there might be might be less than a dozen atoms to consider, than with a simple compound, such as ZnS or PbO, where there are present large arrays of cations and anions. As a consequence, it has been primarily the physicist who has developed theories dealing with energy levels in these simple compounds, and to a certain extent this has created perhaps a "no man's land" between solid state chemists and solid state physicists. It is natural that chemists, desiring to understand the ideas of solid state physics, would prefer to do so in terms of chemical concepts with which they are familiar; for example, using molecular orbital theory, polarisation and electronegativity. To some extent this is possible, and this book attempts such explanations, also in the hope that physicists may gain insight into how some chemists contemplate problems that overlap his realm, for example, the chemist's ideas of ionic charge which probably are only vaguely appreciated by most physicists. Inevitably, the earlier chapters must deal with basic spectroscopy, symmetry and bonding theory, and this is presented rather briefly trusting that the reader has some grounding in these. Thus, the book is intended for the advanced undergraduate and also for research workers embarking on a broad study of inorganic solids. With this in mind, the decision was taken to avoid wherever possible making reference to specific pieces of research work and instead to present a generalised account. Reference to the primary literature is rarely made, but at the end of each chapter is listed a selection of books and review articles, and it is in many of these the adequate reference to orignal work is given.

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Mary Fox:

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