**Book Review published by Analysis, 1997:**

Reflection Electron Microscopy and Spectroscopy for Surface Analysis, By Zhong Lin Wang

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The book describes the analytical techniques based on electron diffraction, reflection and imaging in the TEM (and STEM) for the analysis of materials surfaces. As with most texts dealing with analytical techniques these days it is awash with acronyms and the ones representing the candidate methodologies are frequently encountered. These are RHEED (reflection high energy electron diffraction), REM (reflection electron microscopy), SREM (scanning REM) and REELS (reflection electron energy loss spectroscopy). Many others are included, but the author is considerate enough to define them all in the early pages of his book. The dust-cover notes state that this is 'an entirely self-contained study' in which the 'theories, techniques and applications of REM, RHEED and REELS are comprehensively reviewed'. Inspection of the text reveals that this is, indeed, the case, with three parts (logically Part A, Part B and Part C) of approximately equal length covering the three areas of reflection electron studies. This is preceded by a comprehensive review of the kinematical theory of electron diffraction. This chapter is a very helpful (and necessary) prelude to the rest of the book. It deals with kinematical scattering in the usual numerical manner but the associated text makes this chapter extremely readable. The main body of the text is written in an equally attractive style with the theory of the various topics being introduced alongside the experimental procedures involved. There are many applications of reflection electron microscopy and spectroscopy scattered throughout the book; although inmost cases they serve as illustrations of particular facets of the experimental procedures rather than points which emphasize the relative strengths of the candidate techniques. This is, however, a minor criticism, and the inclusion of examples of real micrographs, diffraction patterns and spectra throughout the text may provide some readers with much needed relief from the undoubted rigour of the theoretical treatments provided.

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There are two particularly attractive aspects of this book to be found in the closing pages. The first is an extensive set (ten) of appendices which contain much useful data along with five FORTRAM programs for interpreting spectra and modeling electron beam/specimen interaction. These have presumably been widely tested in the author's laboratory and their inclusion here is to be welcomed. The other feature, warmly welcomed by this reviewer, is the inclusion of a separate index of the materials used to illustrate the various facets of the reflection techniques. Also included as an Appendix is a chronological bibliography of REM, SREM and REELS covering the years 1975-1995. RHEED is presumably excluded as it is the most senior, and widely used, of the methods considered. This book is not one for those with a peripheral interest in RHEED, REM, SREM and REELS. Referring once again to the cover notes it is offered as an

'ideal guide for scientists and graduate students working on quantitative surface structure characterization using reflection electron techniques' and there is no doubt that this target audience will appreciate the publication of such a concise, authoritative and well written text in their chosen area of endeavor. For those with a TEM background it represents, perhaps, the definitive text for reflection methods and provides all the theoretical information necessary for a thorough appreciation of these techniques. At such a reasonable price for a very specialist text one would hope that it will soon find a place on the bookshelf of every electron microscopy unit with a practical need (or even aspirations) to carry out surface structure determination in the TEM or STEM. For those with a need for such a text this book fulfills all the claims made on its behalf. Dr. Wang is to be congratulated on writing a very accessible text. The book is thoroughly recommended.