Book reviews

Within the frame of a special issue dedicated to recent developments in Microanalysis derived from the work of Professor Castaing, it is particularly welcome to mention recent publications in this field which clearly demonstrate its great actuality.

Electron probe quantitation
edited by K.F.J. HEINRICH and D.E. NEWBURY
(Plenum Press New York, 1991)

This 400 pages hardbound book is intended to update the previous National Bureau of Standards Special Publication 298 "Quantitative Electron Probe Microanalysis" which contained proceedings of a seminar held on the subject at NBS in the summer of 1967. For more than two decades this document had been the reference for many newcomers to the electron probe microanalyser. In 1988, a gathering of international experts, at NBS again, has permitted the edition of this new version. As pointed out by the editors in their preface "After years of substantial agreement on the procedures of analysis and data evaluation, several sharply differentiated approaches have developed. These are described in the publication with all the details required for practical application. The editors hope that their exposition will stimulate the dialogue which is a prerequisite for technical progress".

Before immersing himself in these detailed descriptions, the reader has the great pleasure to learn or to rediscover the "Early times of electron probe microanalysis" as remembered by Raimond Castaing himself. This is a very fascinating old story to grasp how this new apparatus was conceived, designed and built in the late forties. Beyond the instrument there was the huge field of applications, and to be really efficient, it was absolutely necessary to attack the problem of quantitative analysis. Clarifying the involved physical bases was another great success of Raimond Castaing at that time : the $\Phi(\rho z)$ distribution law of the characteristic X-ray emission was introduced in his doctorate thesis in 1951, but its experimental measurement with a tracer technique was only published in 1955. The tribute to Castaing has been paid very elegantly by distinguished witnesses of that period in the first pages of this special *Microsc. Microanal. Microstruct.* issue.

Back to the nineties, in the first chapter of this book, Kurt Heinrich states the problem, i.e. how to transfer the measured X-ray intensities into mass fractions estimates of the elements present. He then identifies the models available for this data reduction : empirical models, ZAF model,

$\Phi(\rho z)$ model and Monte Carlo model. He also addresses these general considerations in his own contribution to the present issue, with a special emphasis on the role of computer development (see *Microsc. Microanal. Microstruct.* **3** (1992)).

The following chapters of the book cover very thoroughly the different methods available for quantitative EPMA analysis. They are written by all the experts who have gradually contributed to the general improvement of our knowledge in this domain over the past decades : V. Scott and G. Love, J.D. Brown, R. Packwood, R. Myklebust and D.E. Newbury, P. Karduck and W. Rehbach. I wish however to underline the important contribution of two groups of french scientists, who have been at some time the students of Raimond Castaing. Jean Louis Pouchou and Françoise Pichoir quite consistently describe the PAP procedure which relies on the fundamental principles of microanalysis and intends to provide a realistic description of $\Phi(\rho z)$. They include in an appendix the complete set of 826 entries in the data basis which they used to test their procedure! On the other hand, Jean Hénoc and Françoise Maurice advocate for the Monte Carlo procedure. All involved steps are described with full details and the listing of the program that they have elaborated for simulating X-ray depth distribution is reported as an appendix. These two examples demonstrate, if necessary, the vitality of the french school of microanalysis founded by Raymond Castaing.

The final two chapters of the book introduce subjects which are presently getting increased recognition as demonstrated with other recent publications discussed further on. The first one (written by Dale Newbury and collaborators) deals in fact with an old topic : quantitative compositional mapping. It goes back to the early days of microanalysis but has really burst out with the advent of modern, efficient and low-cost computers. The second one (introduced by two leading experts in the field, Dave Williams and Joe Goldstein) is devoted to X-ray microanalysis on thin foils. It has now become an essential component of the analytical transmission electron microscope.

In conclusion, this is a very well documented reference book for anybody involved in the practical use of X-ray microanalysis on bulk specimens, which is clearly demonstrated through the application described in some of its chapters.

Transmission electron energy loss spectrometry in materials science
edited by M.M. DISKO, C.C. AHN and B. FULTZ
(Minerals, Metals and Materials Society, TMS, 1992)

"Electron energy loss spectrometry (EELS) is a relatively new addition to the group of diffraction, imaging and spectroscopic techniques available for the study of materials with the transmission electron microscope". This statement by the editors in their preface for this quite recent publication of 270 pages on EELS methods and applications, should however be modulated. Actually the elemental information carried in electron energy loss spectra has been identified nearly fifty years ago by Hillier and Baker, following the first studies on inelastic scattering of electrons from solids by Rudberg in 1936. However the message seems to have been neglected for several decades, during which period the analysis of X ray photons emitted under the action of the incident electron probe, has established itself as the most powerful method for microanalysis under the leading role of R. Castaing.

In fact, the influence of Castaing and his coworkers L. Henry and A. El Hili, has also been prominent for the reemergence of electron energy loss spectroscopy as a tool for local chemical characterization. The introduction, in 1962, of the Castaing and Henry energy filter as a combination of a magnetic prism and an electrostatic mirror, in the electron microscope column,