



Total-Reflection X-Ray Fluorescence Analysis

Reinhold Klockenkamper

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Over the past decade, total-reflection X-ray fluorescence, or TXRF, has been used increasingly for multi element analysis in laboratories and industry worldwide. Providing reliable, economical readings of the minute mass or low concentration of elements, TXRF is especially suitable for micro- and trace analysis. It is also effective in the analysis of flat sample surfaces and stratified near-surface layers, offering a nondestructive means of quality control of wafers for the semiconductor industry. This is the first book dedicated to this powerful and highly efficient analytical tool. Written by a leading expert with three decades of specialization in X-ray spectral analysis, it features a remarkably readable treatment complete with hundreds of illustrations, equations, and references. Using only a minimum of mathematics, the author focuses on practical applications of TXRF in a variety of disciplines, including geology, biology, material and environmental sciences, medicine, forensics, and art history. The book begins with an introduction to the physical fundamentals of X-ray fluorescence and the principles of total reflection. A survey of TXRF instruments and their operation includes high-power X-ray sources, beam-adapting units, sample positioning, and energy-dispersive detection and registration. Professor Klockenkamper shows readers how to perform analyses, using sample preparation and spectra recording and interpretation, and presents real-world examples from environmental, medical, industrial, art-historical, and forensic applications. The book closes with a discussion of the latest developments in the field, drawing a comparison between TXRF and other methods of analytical atomic spectroscopy. Total-Reflection X-Ray Fluorescence Analysis helps professionals evaluate the suitability of this method to their specific needs, pinpoint new applications, and gain insight into the future of TXRF. It is an excellent text for graduate students and a useful guide for scientists and technicians in a wide range of fields. This is the first monograph to be devoted entirely to total-reflection X-ray fluorescence (TXRF)-a young, yet powerful method of analytical atomic spectroscopy. Written by a leading expert in X-ray spectral analysis, the book provides an overview of the field, reveals the advantages of TXRF over competing methods, and describes its application in numerous disciplines, including geology, biology, material and environmental sciences, medicine, toxicology, forensics, art history, and archaeology. Tables, figures, equations, and examples are provided throughout. The author discusses both theory and techniques, and walks the reader through the necessary steps to get highly reliable determinations of the minute mass or low concentration of elements. Remarkably communicative and accessible, this book Explores the uses of TXRF in micro- and trace analysis, and in surface- and near-surface-layer analysis Explains instrumentation and setups, particularly high-power X-ray sources, beam-adapting units, sample positioning, and energy-dispersive detection and registration Offers helpful tips on performing analyses, including sample preparations, and spectra recording and interpretation Features real-world examples from a variety of disciplines Includes hundreds of references for further study

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