6. ELECTRON ENERGY ANALYZERS

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6.1 Introduction

Electron energy analyzers are principal components in a broad range of important spectroscopic tools used in scientific research and analytical applications. To obtain optimum performance from an analyzer, it is usually necessary to understand not only its basic operating principles but also some of the more subtle details that ultimately limit performance. This chapter provides a practical guide to understanding, selecting, constructing, and using electron energy analyzers. Essential aspects of their design and operation are described. Useful formulas relating to the more common deflection-type analyzers, and an extensive bibliography of relevant literature, are included.

6.2 Electron Energy Analyzing Systems

Various options are available for measuring the energy and angular distribution of electrons emitted from some source, and careful consideration of the source characteristics and the experimental requirements can lead to improved experimental capabilities by optimizing the choice of electron energy analyzer used. This section discusses several of the more common types of electron energy analyzers and outlines some of the criteria that should be considered in selecting an electron analyzer for a specific application.

6.2.1 Time-of-Flight Devices

Time-of-flight techniques are generally limited to ion detection due to the extremely high velocity of electrons even at low kinetic energies. However, in cases in which electrons are produced from the source region in pulses, a time-of-flight technique might be appropriate for energy analysis. Suitable sources for time-of-flight-based electron energy analyzers include pulsed lasers, Kerr-cell-switched CW lasers, and synchrotron radi-

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