

X-RAY FLUORESCENCE—AN IMPROVED ANALYTICAL TOOL FOR TRACE ELEMENT STUDIES

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1. Introduction

This conference is dominated by discussion of the hazards associated with radiation; the present author feels that this exaggerates the importance of radiation levels as a hazard to health, when compared to other environmental insults to which we are subjected. One such insult is that produced by toxic metals introduced into living systems via many routes from industrial and natural sources. The purpose of this paper is to describe the use of X-ray fluorescence analysis with semiconductor detector spectrometers as a tool to permit fast analysis of specimens for a broad range of chemical elements present in trace quantities (that is, < 1 ppm by weight).

Before discussing trace element analysis, it may be useful to examine some possible reasons for the emphasis on radiation seen at this meeting, and to relate these to the situation seen in regard to trace elements.

1.1 Sources of radiation exposure to living things are well defined both in location and time. Nuclear explosions, reactors, X-ray sources and other radiation sources are constantly scrutinized by local, national and international agencies. Contrasting with this situation, the release of toxic elements by natural and industrial sources is subject to virtually no control or monitoring.

1.2 Public and governmental sensitivity to the hazardous nature of radiation has resulted in large programs to improve radiation measurements, and to evaluate radiation effects. Minor parallel steps are only now being taken to establish similar parameters for trace elements.

1.3 Indices of radiation effects are fairly well established. While authorities may differ in their interpretation of such studies, incidence of cancer and leukemia, longevity, and infant mortality rates have all been used as indicators of radiation effects. Although relationships between trace elements and certain diseases are known to exist, and others are suspected, few large scale statistical studies have been made to define the range of possible connections. We should also note that the wide variety of trace elements, and of their effects, make

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