

Dr. Karl Bernstein
Codevintec Pacific Inc.



activation analysis

Technological progress
and increasing analytical demand
lead to industrial application
of neutron activation analysis

SAFE, ECONOMICAL, MODERN neutron activation analysis (NAA) systems are a practical answer to many industrial process control and quality assurance analysis requirements.

For the first half of its quarter-century history, the practice of activation analysis was confined to research laboratories or to simple analytical problems. Only a single active species was to be determined, and the matrix material offered no interference.

At the time of Dr. Vincent Guinn's excellent 1964 review of neutron activation analysis (1), the multichannel analyzer had just

been introduced, enabling useful but laborious multielement analysis.

Today, sophisticated automated NAA systems have evolved, taking full advantage of the last decade's technological advances in neutron sources, detectors, and small computers. Modern systems are easily operated by technicians. They can be installed in almost any ground-floor laboratory.

NAA is sensitive, fast, economical, and nondestructive to the sample. These features and the inherently safe character of new sealed-tube neutron generators assure NAA systems an increasing portion of the total analytical task in many production applications, as well as in research laboratories.

The typical use of samples several milliliters in volume reduces the sample preparation task. It now is relatively easy to assure a representative sample.

Agricultural and food industry applications of NAA currently are attracting a great amount of attention. Nitrogen, phosphorus, potassium, and some troublesome elements can be measured in plant and animal tissues. Food products ranging from grain to meat are analyzed routinely for protein by the measurement of the nitrogen content. A laboratory in the USSR performs multielement analysis of grain samples at rates up to 500 samples per day.

Other applications for neutron activation analysis include wear studies, trace element measurements in the petroleum industry, measurement of oxygen and other trace or minor elements in metals, pollution source identification, and other legal applications. The chemical industry undoubtedly will identify many economical applications for automated, safe NAA, systems.

In addition to providing both routine and special analyses, the NAA system components can offer a flexible research capability to a sophisticated laboratory. The computers are easily programmed to solve other problems, and the detector and computer can analyze naturally radioactive materials, as well as samples activated at other facilities.

Tracer experiments of interest in process research can be conducted advantageously with the analysis system. And the neutron generator can produce millicurie quantities of many short-lived isotopes to support the tracer experiments. The primary industrial interest in NAA will remain the analysis of large quantities of similar materials, but the research flexibility of the system offers an unusual potential advantage.

Early activation analysis "systems" consisted of no more than a neutron source, a shielded detector with its associated amplifiers (and perhaps with a single channel analyzer to select an energy band of inter-