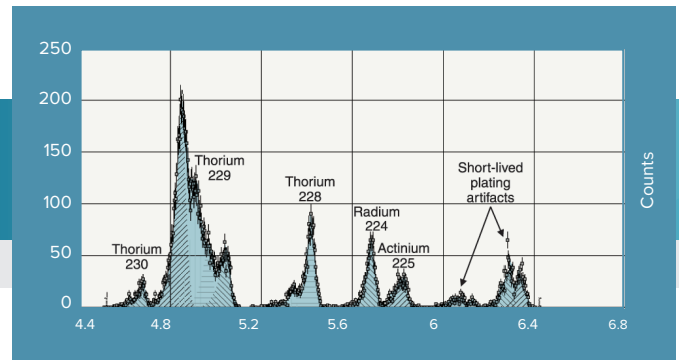# Genie™ 2000

Alpha Analysis Software

KEY FEATURES

- Comprehensive Alpha Spectrum Analysis for Genie 2000 software
- Background subtraction schemes specific to Alpha Spectroscopy, including Reagent Blank subtraction
- Alternative Peak Search Strategies
- Fully interactive peak fit when used with S506 Genie 2000 Interactive Peak Fit Software
- Efficiency Correction and Nuclide identification
- MDA calculation in the Currie formalism, KTA formalism, or ISO11929 compliant option
- Full support for Tracer and Tracerless Analysis
- Algorithms are accessible interactively as well as through the Batch Procedures environment

DESCRIPTION

The Genie 2000 Alpha Analysis software provides the alpha spectroscopist with a set of advanced spectrum analysis algorithms. Used in conjunction with the Genie 2000 Basic Spectroscopy Software, this optional analysis package adds Alpha Spectrum Analysis features to the spectroscopy window. The algorithms permit a variable tail component typical of peaks found in alpha spectra. Tentative peak shapes are established during the energy calibration and used during efficiency calibration and peak locate and area calculations.

Alpha Spectroscopy Analysis provides access to all of the system's functions. Analysis of alpha spectra can be performed manually, executing each operation a step at a time, or a complete analysis sequence can be defined. The entire process is menu driven, presenting easy access to all necessary parameters.

In addition to the manual mode, an analysis sequence can be defined which contains all the analysis and reporting steps, complete with their appropriate parameter definitions. Once created, analysis sequence files can be stored for latter use or invoked for immediate processing. Comprehensive acquisition through reporting sequences can later be invoked with a single command.

PEAK LOCATE SCHEMES

Three alternative schemes for locating peaks can be selected by the operator. The simplest routine compares the acquired spectrum with peaks in a selected library file. Another routine permits the operator to define regions of interest (ROIs) in the spectrum, then automatically calculate the peak centroid for each ROI. Regions of interest can be defined manually in the Spectroscopy window or the peak search can refer to a pre-defined ROI file. The third routine relies on a generalized second difference method for locating peaks that exceed a user-selectable significance threshold.

The peak locate schemes can also be used to supplement each other where a user-selectable energy tolerance will determine whether the next peak locate algorithm has found a new peak or merely recognized a peak that has already been found by previously executed algorithms.

Traditionally, manually defined ROIs have been a sufficient peak locating mechanism for alpha spectroscopy. However, advanced spectrum analysis is essential for de-convoluting difficult alpha spectra when re-preparation of the sample is not possible and a ROI peak locate is not acceptable due to multiplets and variable tailing.

An example of the capabilities of the peak locating algorithms that the Genie 2000 Alpha Analysis Software offers is shown with an actual spectrum.

Without the flexibility in peak locating choices, the alpha spectroscopist would have no other alternative than to chemically reprocess this sample to eliminate some of the interfering peaks.

Using the Genie 2000 Alpha Analysis Software peak locate algorithms, the alpha spectroscopist can obtain the results found below by using a simple analysis sequence file. All peaks were successfully identified and quantified using a combination of the simple library directed peak locate and the generalized second difference method with parameter settings optimized for this type of spectra.

PEAK AREA CALCULATION SCHEMES

Peak area calculations can be performed either by summing the counts in a region of interest, or by performing a peak fit to the data using a modified Gaussian function. The summing of the counts is particularly useful when the spectra exhibit very poor statistics with no clear peak shapes or when the peak resolution does not permit multiplet fits, a situation that is quite common in alpha spectroscopy. The fitting option permits fitting singlets as well as multiplets, and allows the FWHM and tail parameters to either stay fixed to the calibrated values or vary for best fit to the data being analyzed. The fitting options are particularly useful when the statistics in the spectrum are quite good, and the sample preparation and mounting techniques have resulted in very good resolution spectra.

BACKGROUND SUBTRACT

Although alpha spectroscopy backgrounds are normally quite low, precision often requires subtraction of some background components in the spectrum. The background subtraction algorithm in Genie 2000 Alpha Analysis software uses an operator selected background file to subtract the sum of the counts in the equivalent ROI in the background spectrum from the counts in the sample spectrum. Alternatively, the operator may set a tolerance for matching the peaks in the sample spectrum with those in the background file. A critical level test can be applied to every peak after the background has been subtracted.

NUCLIDE IDENTIFICATION

The Nuclide Identification algorithms provide a variety of tools that can be customized to the application. Nuclide identification is based on operator-selected libraries of alpha emitters. The performance of the algorithm can be fine tuned by adjusting a confidence threshold as well as the identification tolerance, conveniently based on energy or full width at half maximum. For precise work or where chemistry has not significantly reduced interfering peaks, the Nuclide Identification algorithm can automatically perform an interference correction.

DETECTION LIMITS

The Alpha Analysis software provides the spectroscopist with a choice of formalisms for calculating the "Minimum Detectable Activity" (MDA), including an ISO11929 compliant option. The MDA can be calculated for the nuclides which have been found in the spectrum, as well as those which have not been found.

RELEVANT SPECIFICATION SHEETS AND MANUALS

- S500/S502/S504 Genie 2000 Basic Spectroscopy Software.
- Alpha Analysis User's Manual.

ORDERING INFORMATION

- S509C Genie 2000 Alpha Analysis Software.
- Requires S500C/S502C/S504C Genie 2000 Basic Spectroscopy Software.

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