

EXPERIMENT 4.1

Energy Loss of Alpha Particles in Thin Metallic Foils

Experimental Procedure

(dE/dx for Copper)

1. Set up the equipment as shown in fig. 4.3. Use the ^{210}Po source and the pulse generator to construct an energy versus channel calibration curve. The gain of the amplifier should be set such that the 5.305 MeV alphas from ^{210}Po are approximately in channel 800. Calculate the slope of the calibration curve in keV/channel.

2. Turn off the bias and vent the system to air. Place the thinnest copper foil between the ^{210}Po source and the detector, and pump the system back down. Return the bias to its recommended value and determine the position of the alpha peak. From the calibration curve, determine its energy (E_f) and record this value in Table 4.3.

3. Turn off the bias and slowly let the system up to air. Remove the copper foil and replace it at the same position with the next thickest foil. Determine the energy of the ^{210}Po alphas through this foil and record the measured value in Table 4.3.

4. Repeat for the rest of the copper foils in the set. Figure 4.4 shows a typical superposition of several of the above measurements on the same graph.

5. This experiment may also be done for any of the other foils that the instructor may provide (see Tables 4.1 and 4.2 or ref. 7). Figure 4.4 shows a typical pulse height spectrum of the ^{210}Po alphas before going through a foil. This experiment could have been done with any of the alpha sources that were shown in Experiment 3. Figure 4.5 shows a spectrum of another alpha source which is suitable for this experiment ^{234}U .

NOTA: Use sample 5.305 MeV
na análise

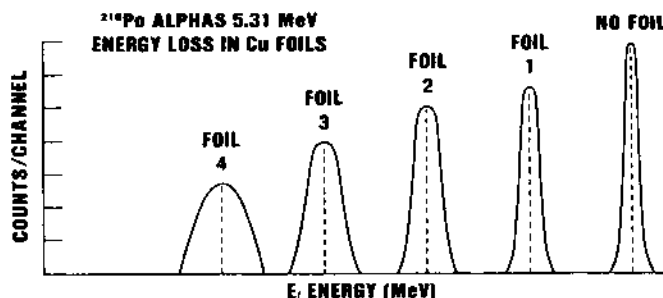


Figure 4.4. Composite Spectra of the Energy Loss of ^{210}Po Alphas in Thin Copper Foils.

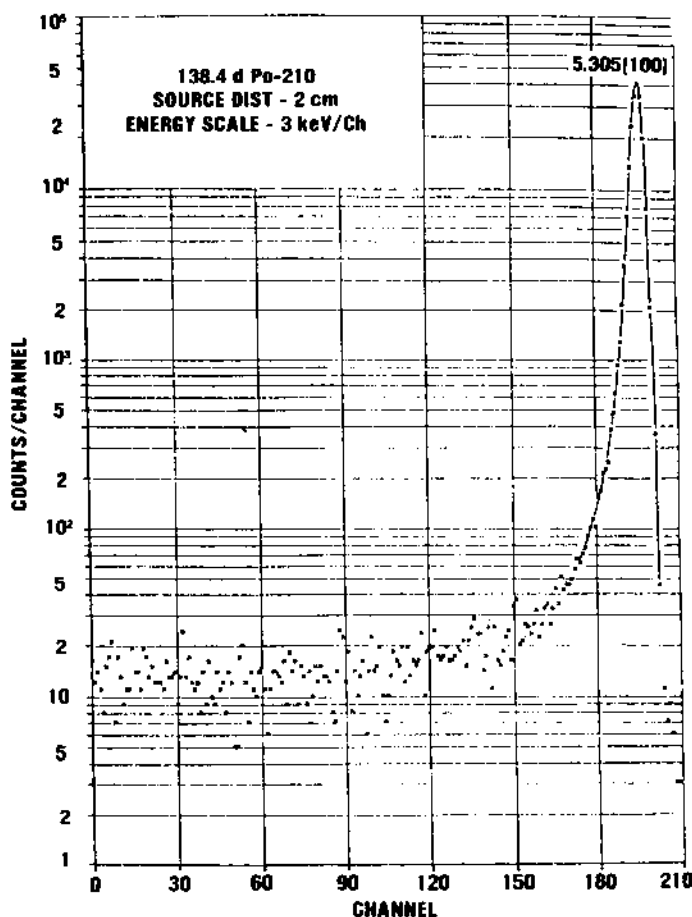


Figure 4.5. Alpha Particle Pulse Height Spectrum of ^{210}Po (No Foil).

Table 4.3 Comparison of the Experimental and Theoretical Value of Energy Loss of ^{210}Po Alphas in Thin Copper Foils

| No. | Foil Thickness mg/cm^2 | Channel | Final Energy E_f MeV | ΔE_m Measured MeV | ΔE Theory Range Method | ΔE Theory (dE/dx) average | ΔE Theory (dE/dx) por tabela |
|-----|--|---------|------------------------|---------------------------|--------------------------------|---------------------------------------|--|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |