Energy Dependence of Aluminum KL Double Ionization by Electron Bombardment

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**Objectives**

- Recondition a flat crystal spectrometer.
- Measure the aluminum intensity ratios $I_{KL1}/I_{K\alpha}$ as a function of electron beam energy.
- Compare with available results.

**Background**

When an electron makes a transition from higher shells to fill a vacancy in the K shell, an x-ray is emitted. These x-rays are called K\alpha, K\beta, K\gamma, etc., depending on which shell they come from.

Spectral lines in K x-ray spectra

- N
- M
- L
- K

The KL\textsuperscript{1} x-rays are the ones produced when one of these electronic transitions occurs in the presence of a vacancy in the L shell (Double Ionization)

Mechanisms for KL Double Ionization

- Shake
- TS1
- TS2

Proportional Counter
PCA
Preamplifier
Amplifier
Timing SCA
Delay
Lin. Gate Str.
Current Integrator
Scope
Control unit
Electron Gun
Stepping Motor
Soller Slits
ADP Crystal

**Schematic diagram-Experimental Setup**

\[ 2d \sin \theta = n\lambda \]

**Flat Crystal Spectrometer**

**Complete Experimental Setup**

\[ 5.0 \text{ keV electrons on aluminum} \]

**Final Spectrum**

Energy dependence of aluminum KL\textsuperscript{1}/K\alpha x-ray intensity ratio

**Present results**


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**Problems encountered during the experiment**

- High Background due to Bremsstrahlung.
- Carbon deposit on the target due to electron irradiation.