MEASUREMENT OF TRACE NATURAL RADIOACTIVITY OF POTASH FERTILIZER

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Abstract: One of the isotopes of Potassium K-40 is naturally radioactive with long half life of 1.251×10^{9}years. Potassium is important content of potash fertilizer which is routinely used by the farmers in agriculture. The excess use of this fertilizer introduces the radioactivity in soil, water and eventually in food products. It is essential to know the activity of potash in soil in order to know the nuclear pollution of soil, water and food products. In the present work, absolute and specific activities of potash samples are measured using nuclear radiation detector. Average specific activity of potash samples is found to be 17.33 Bq/gm.

***Keywords*- Radiation detector, Potash Fertilizer, Activity of Potash, Specific Activity of Potash**.

I. INTRODUCTION

Potash is one of the important part of the chemical fertilizer used in agriculture. Potash fertilizer mainly contains KCl compounds. One of the isotope of Potassium is K-40, which is naturally radioactive and which emits β-particle with maximum energy 1.32MeV with long half life of 1.251×10^{9}years. Excess use of this fertilizer increases the radioactivity in the soil and eventually in water. It is necessary to know the activity of potash in soil in order to avoid the nuclear pollution in soil, water and agricultural products. In view of this, present work is carried out to know the specific activity of potash fertilizer.

II. RESEARCH METHODOLOGY

2.1 Sample Preparation and Experimental Set up:

Samples of different masses were prepared from the potash fertilizer. The natural β-activity of K-40 in Potash was measured for each of these samples using G.M. Counter and NaI(Tl) Scintillation gamma ray spectrometer. G.M. Counter was calibrated using the standard β and γ radioactive sources provided by B.A.R.C., Mumbai. The efficiency of G.M. Counter for β-particle and γ-rays detection was calculated using the standard sources with known energy. Geometrical factor for the sample arrangement was estimated for the given experimental setup. All the experimental parameters were kept constant during observations.

2.2 Theoretical Framework:

Activity of each Potash sample was calculated using the standard relations.

$$A_t=A_0e^{-\lambda t} \qquad (2.1)$$

$$\text{Absolute Activity}=A_{out}/E\times G.F. \qquad (2.2)$$

A_{out} is the measured activity of the sample.
E is the efficiency of detector.
G.F. is the geometrical factor.
λ is the decay constant.
A_0 is the initial activity of the sample.
Geometrical factor is calculated using the measured experimental parameters for sample-detector assembly. Specific activity of the potash is finally calculated and reported in the work.

III. RESULTS AND CONCLUSIONS

Table 3.1 Activity of Potash with respect to different mass

Mass (gm)	Activity (Bq)
1	33.86
2	45.08
3	47.36
5	56.72
6	68.37
8	72.69

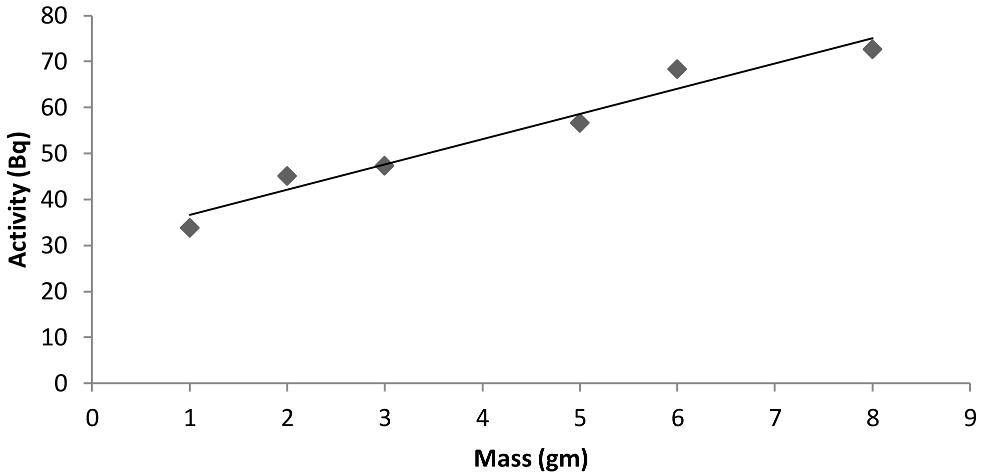

Figure 3.1 Plot of activity(Bq) versus mass(gm) of Potash

Figure 3.1 shows the variation of absolute β-activity of Potash with different masses of sample. Result shows that absolute activity of potash fertilizer increases with increase in mass of the sample. Average specific activity of potash was calculated from the measured activities of the samples. Average specific activity of potash fertilizer is found to be 17.33 Bq/gm.

IV. Acknowledgment

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