CHAPTER I

INTRODUCTION

Since 1935, α-and β-active (4n+1) nuclei have been produced by artificial transmutation. Almost a dozen of these nuclei have been produced from the heavy elements. Their radioactive properties have been investigated. The longest-lived species in the(4n+1) series, $^{237}_{93}Np$, was studied by Wahl and Seaborg[1] in 1942. By measuring the ratio of ^{237}U to the daughter ^{237}Np activity, they determined the half-life of ^{237}Np to be $\sim 3 \times 10^6$ years. Magnusson and La Chapelle[2] in 1944, obtained a half-life of $(2.20 \pm 0.10) \times 10^6$ years by measuring the activity of accurately weighted samples of NpO_2. Later Brauer et al.[3] obtained a half-life of $(2.14 \pm 0.01) \times 10^6$ years which corresponds to a specific activity of 1562 ± 7 disintegrations per minute per microgram. This latter value is in agreement with the presently accepted value of 2.20×10^6 years.

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[1] A.C. Wahl and G.T. Seaborg, "The Transuranium Elements", Nat. Nucl. Energ. Ser. (Paper 1.5, 14 B, New York: McGraw-Hill Book Co., Inc., 1949)

[2] L.B. Magnusson and T.J. La Chapelle, "The Transuranium Elements", Nat. Nucl. Energ. Ser. (Paper 1.7, 14 B, New York: McGraw-Hill Book Co., Inc., 1949)

[3] F.P. Brauer, R.W. Stromatt, J.D. Ludwick, F.P. Roberts and W.L. Lyon, J. Inorg. Nucl. Chem. 12 (1960) 234.

In the previous determinations, the half-lives were obtained by using other scintillation, or proportional counters or ionization chambers. Recently semiconductor detectors have been developed. Among these are the surface barrier detectors which offer better resolution and handling properties than the previous type of detectors. It is the aim of the present investigation to determine the half-life of ^{237}Np by measuring the α-particle activity using a surface barrier detector. The samples of ^{237}Np were prepared by electrodeposition technique, and then precise measurements of the activities of the ^{237}Np samples could be obtained with the surface barrier detectors. It was found that the half-life of ^{237}Np is $(2.41 \pm 0.06) \times 10^6$ years. Details of the experimental work will be described in the following sections.