

## Chemical Analysis by the Measurement of Nuclear Moment. (Nuclear Momentscope Analysis)

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An apparatus for observing the nuclear magnetic resonance has been constructed as an extension of the researches on the high-frequency titrimetry,<sup>(1)</sup> and the utility for the qualitative and quantitative analysis has been studied, although this resonance experiment has been already carried out for the precise measurement of the moments<sup>(2)</sup> or of the magnetic field.<sup>(3)</sup>

The sample is mounted in a coil of the receiver circuit and the coil is placed in the magnetic field with its axis perpendicular to the field direction. The radio-frequency waves of constant frequency (15.25 MC; with the modulation unit of 280 C. P. S.) are supplied to this circuit and the strength of the magnetic field is varied very slowly. The transitions occur which result in an absorption of energy from the radiofrequency field when the radio-frequency coincides with the Larmor precessional frequency of the atom. As the moment of  $^1\text{H}^1$  is close to that of  $^9\text{F}^{19}$ , the absorption lines of the two elements have been compared with each other. The intensity of the energy absorption which is measured by the voltage drop of the out-put power from the detector circuit has shown good correspondence to the amount of the each element in the sample, as it is given in Table 1, when the sensitivity of

(1) S. Fujiwara and S. Hayashi, *Report of Univ. of Electro-Communications*, **1**, 112 (1950).

(2) J. E. Mack, *Rev. Modern Phys.*, **22**, 64 (1950).

(3) N. J. Hopkins, *Rev. Sci. Inst.*, **20**, 401 (1949).

Table 1

No.	Sample	Intensity of the energy absorption	
	Paraffin + Na <sub>2</sub> SiF <sub>6</sub>	<sup>1</sup> H <sup>1</sup> , volt	<sup>19</sup> F <sup>19</sup> , volt
1	0.5 g.    0 g.	-0.10	0
2	"        0.1	-0.10	-0.08
3	"        0.3	-0.10	-0.27

the apparatus has been held appropriate. When the sensitivity of the apparatus is sufficiently raised, the energy absorption line has been easily observed with one-tenth milligramme of fluorine.

With the improvements in the apparatus, it will be possible to utilize the method for the chemical analysis, especially, of the solids, or for the determination of isotopes of heavy metals as an only suitable method.

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