However, this must await the clearing up of the values to be assigned the ground states of Co⁶¹, Ni⁶¹, and Cu⁶¹.

* This work was supported in part by the reaction reconstruction of the second seco * This work was supported in part by the National Research Council of

Laboratory Observation of the $A^2\Pi - X^2\Sigma$ Bands of the N_2^+ Molecule

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 ${\rm B}^{\rm OTH}$ the electron configuration of N₂⁺ and the observed spectra of isoelectronic molecules lead one to believe that the N_2^+ molecule has a low-lying ²II state. Meinel² has observed a system of bands in the infrared spectrum of the aurora which he has attributed to transitions from this 2II state to the ground state. Up until now, however, no such bands have been observed in laboratory spectra. Recently we have succeeded in exciting these bands in a discharge tube.

A mixture of helium and nitrogen was passed through a hollow cathode discharge tube and the spectrum of the discharge photographed on the first order of a twenty-one foot concave grating. When the pressure of the helium in the discharge tube was high and the quantity of nitrogen very small, the first positive bands of nitrogen appeared only weakly while the ultraviolet bands of N2⁺ were strong. Under these conditions the infrared spectrum of the discharge has been photographed on N and M plates with exposure times of several hours.

Besides the well-known first positive bands of nitrogen, the infrared spectrum of the discharge tube shows a system of bands degraded to the red. Each of these bands has two prominent heads and others less prominent. The positions of the strong heads, together with a possible vibrational numbering, are shown in Table I. On our plates the (4,2) (3,1) and (2,0) bands are strong and free from overlapping lines, while the (2,1) and (2,0) bands are very weak and the (3,0) band is overlapped.

The agreement between our wavelengths and those of Meinel as shown in Table I leaves no doubt that the bands observed here are the same as those observed in the aurora. The consistent difference of about 3A between the two sets of measurements is the result of the fact that Meinel has measured intensity maxima whereas we have measured band heads. Also the assignment of these bands to the N_2^+ molecule appears certain for the following reasons. First, the structure of the bands is very similar to that of the ${}^{2}\Pi - {}^{2}\Sigma$ bands of the isoelectronic CN molecule. Second, within the fine structure of the bands the lines of the series show the alternation of intensities which is to be expected in bands of the N_2^+ molecule. Finally, the magnitude of the vibrational quanta of the lower state of these bands agrees with that calculated from the well-known ultraviolet N2+ bands.

TABLE I. Infrared bands of No+.

Vibrational numbering	Wavelength, A Authors Meinel		Vibrational numbering	Wavelength, A Authors Meinel	
1,0	9208.00 9147.31(?)		2,0	7874.63 7825.72	7879.6 7828.2
2,1	9502.27 9428.90(?)		3,1	8105.31 8053.63	8107.0 8056.8
3,0	6890,49	6892.2	4,2	8348.25 8293.41	8349.2 8297.6

An analysis of the fine structure of these bands is in progress and the results will be published in the near future.

We are indebted to Dr. G. Herzberg for helpful discussions of this problem.

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TUCLEAR induction signals of Te^{123, 125} were detected in a solution of TeO₂ (3.1 molar) in HCl and chemically pure tellurium metal in aqua regia. Signals of Te125 with a line width of about 1/10 gauss (probably in part determined by the magnetic field inhomogeneity) were observed in both the above solutions without the addition of paramagnetic ions.

A comparison of the resonant frequency of Te¹²⁵ with that of Na²³ gives the result

$$Te^{125}$$
/ $\nu(Na^{23}) = 1.19457 \pm 0.00004.$ (1)

With the known magnetic moment of Na²³ and the fact that the spin of the tellurium isotopes is $\frac{1}{2}$, $\frac{1}{2}$ the sign and value of the magnetic moment of Te¹²⁵ were found to be

$$\mu(\mathrm{Te}^{125}) = -0.88235 \pm 0.00004. \tag{2}$$

This value agrees well with the spectroscopic data in the literature.3

The abundance of Te123 being only 0.85 percent, one would expect the signal amplitude of the isotope to be about 1/8 that of Te125, whose abundance is 7.0 percent. If was therefore necessary to modify the present spectrometer⁴ with the introduction of an amplifier of higher gain and lower noise figure.⁵ This apparatus permitted the detection of Te123 signals with a signal-to-noise ratio of about seven. Thus a comparison of the resonant frequency with that of Na²³ yielded the results¹

$$\nu(\text{Te}^{123})/\nu(\text{Na}^{23}) = 0.99085 \pm 0.00003$$
 (3)

$$\mu(\mathrm{Te}^{123}) = -0.73188 \pm 0.00004.^{3}$$

The ratio of the magnetic moments of the two isotopes is therefore calculated to be

$$(Te^{125})/\mu(Te^{123}) = 1.20560 \pm 0.00007,$$
 (5)

which is in good agreement with that of Mack and Arroe.⁶ The ratio of signal amplitudes of the two isotopes was found to be in agreement with the known ratio of abundances within an experimental error of about 5 percent.

It is known that there exists monatomic tellurium⁷ in acid solutions and further, that these atoms are likely to be paramagnetic in analogy with oxygen. It was for this reason that paramagnetic catalysts were not added to the solutions, and the fact that good signals were detected may be ascribed to the action of these paramagnetic atoms.

The first tellurium signals of a natural line width of one gauss were observed in a sample of powdered tellurium metal. The fact that one deals here with nuclear induction in a semiconductor may be of interest in view of the resonance shifts observed by Knight⁸ in metals; no observable shift was found between the resonance frequency of Te¹²⁵ in the metal and in solution. In spite of its low conductivity it was necessary to pulverize the metal in order to reduce losses caused by eddy currents.

The use of metallic tellurium was encouraged by previous experiments in which signals of Si²⁹ were found in powdered silicon metal. Signals were also found in a solution of 2.5 molar SiO₂ in