size of the meteorite parent body, and the other that it is a product of direct crystallization in the parent body[15]. Our observations suggest that irregular masses and morphological single crystals of diamond occur together in Canyon Diablo, as they do in terrestrial diamond deposits, and that both have been more or less completely converted to microcrystalline aggregates of the hexagonal, wurtzite-like polymorph by terrestrial or pre-terrestrial shock.

We suggest lonsdaleite as the mineralogical designation for the hexagonal polymorph of diamond here described from a natural occurrence. The name is given after the distinguished crystallographer, Professor Kathleen Lonsdale, who has made numerous contributions to our knowledge of diamond. The name has the approval of the Commission on New Mineral Names of the International Mineralogical Association. The designation of further polytypes in this substance, in addition to lonsdaleite-2*H*, should follow the systematic notation originally proposed for silicon carbide and zinc sulphide. The name lonsdaleite has the concurrence of Dr. F. P. Bundy and his colleagues at General Electric Company whose work on the hexagonal polymorph has been earlier cited, and we thank them for information provided during the present study.

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CHEMISTRY

Vibrational Deactivation of Excited States of Nitrogen created in a Microwave Discharge

MOST work on the vibrational deactivation of diatomic molecules has been carried out on ground states at moderate temperatures. There is a relative scarcity of information about excited states. In order to use emission spectroscopy as an analytical tool, a population distribution in the excited state markedly different from that which would be imposed by thermal equilibrium is required. This has been achieved by excitation by a single line[1] and by recombination of atoms to form highly excited molecules[2]. An experiment was carried out to determine whether a low pressure microwave discharge would be a suitable source of vibrational overpopulation.

Optical emission was observed from a 2,450 Mc/s discharge in pure dry nitrogen at 0·75–8·0 torr with a 0·5 m grating monochromator and 9558 *b* photomultiplier of calibrated response. The intensities of the 0,0 series of the 2nd Positive and 4,0 series of the 1st Positive systems were observed as functions of the pressure, and the vibrational temperatures (T_v) of these systems (measures of the population distributions) were calculated using the relative band strengths of Wallace and Nichols[3] and Jansson[4]. Extensive rotational structure of the N_2^+ 1st Negative system made the measurement of the intensity of this system very uncertain. Over the pressure range 1·0–8·0 torr T_v of the $B^3\Pi_g$ state remained unchanged at $9{,}450 \pm 250°$ K, which reflects the inefficiency[2] of vibrational deactivation of this state by ground state $X^1\Sigma_g^+ N_2$.

Although $B^3\Pi$ is the terminal state of the 2nd Positive system, the measured intensities of the bands 4,0 to 12,8 can scarcely have been affected by 2nd Positive emission, this being primarily to lower vibrational levels than $v' = 4$ in $B^3\Pi$.

As shown in Table 1, T_v of $C^3\Pi_u$ decreased from 10,200 $\pm$ 250° K at 0·75 torr to 5,200 $\pm$ 250° K at 8·0 torr, indicating a much greater probability of collisional deactivation by the ground state. Over this pressure range[5] the neutral gas temperature increased only from 3,300° K to 3,700° K, while the electron density remained constant at $3{\cdot}7 \times 10^{10}$ cm^{-3}. It was not possible to measure the electron temperature directly, but it must have been much higher than the neutral gas temperature, because the square of the ratio of the collision frequency for momentum transfer to the radian frequency of the exciting field $|\nu_{m/\omega}|^2 < 10^{-4}$. Under these conditions the neutral gas and the electron temperatures are well separated[6]. The change in the vibrational temperature of $C^3\Pi$ with increasing pressure shows a tendency for that state to come into equilibrium with the neutral gas temperature during its lifetime.

Table 1

p (torr)	T_v (° K)
0·75	10,200 ± 250
1·5	9,400
2·5	8,200
3·5	7,800
5·0	7,000
6·0	6,500
8·0	5,200

The states $B^3\Pi$ and $C^3\Pi$ are created by impact with fast electrons in the tail of the electron temperature distribution. The constancy of T_v for $B^3\Pi$ (which is insensitive to collisional deactivation) shows that the electron temperature is not affected significantly by the change in pressure. This might also be inferred from the value of $|\nu_{m/\omega}|^2$. With careful monitoring, therefore, such a low pressure, high frequency discharge is a suitable source of overpopulation of $C^3\Pi_u$, and a more detailed investigation of its vibrational deactivation would be worth while.

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