Central Pacific recorded similar abnormal magnetic effects.

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Emission Spectrum of N_2O^+

In the course of a study of the luminescence of gases irradiated by X-rays (to be published), some unknown bands were observed from nitrous oxide. All the other gases studied emit well-known band systems, usually of the parent gas or its ion. Gases at pressures between 1 and 700 mm. were irradiated with soft X-rays (45 kV. peak) from a beryllium-window tube, and the spectra photographed or scanned with a photomultiplier through a Hilger *D*.96 *f* 2 quartz spectrograph. The emission from nitrous oxide consisted of the unknown bands at about 3680, 3540 and 3380 A. and the nitric oxide β system (the bands in the $v' = 0$ progression between $v'' = 3$ and 13 were observed). The latter system has been observed previously as fluorescence from nitrous oxide irradiated with vacuum ultra-violet light[1]. The two sets of bands differ in their dependence on pressure; the β bands suffer little collisional deactivation at high pressures whereas the new bands are strongly 'quenched', but they must be much more strongly excited since the intensities are roughly comparable at 600 mm. Since carbon dioxide excited by X-rays emits CO_2^+ bands ($^2\Sigma_u - {}^2\Pi_g$, ref. 2, and $^2\Pi_u - {}^2\Pi_g$, ref. 3) and these show a similar pressure dependence, the new bands are tentatively ascribed to N_2O^+. Emission by nitrous oxide (N_2O) itself is unlikely from a consideration of its excited states[4].

The observed light intensity was very small (8-hr. exposures with ½ mm. slit-width were necessary to photograph the spectra on *HPS* plates) and the dispersion low (100 A./mm. at 3500 A.) so the bands could not be properly characterized with this apparatus. Therefore an attempt to excite the bands in a discharge tube was made. If the identification is correct, they should appear in the negative glow; low current density and rapid flow of the gas would be necessary to reduce the decomposition of nitrous oxide which occurs in the discharge.

The discharge tube was a T-shaped 'Pyrex' tube, with ¾ in. internal diameter, 2 in. long aluminium tube as cathode and a smaller aluminium tube in a side-arm as anode; nitrous oxide was pumped through the tube from cathode to anode; spectra were photographed through a silica window with a Hilger medium quartz spectrograph. The positive column in the side tube was coloured green or pink (first positive bands of molecular nitrogen); the cathode glow was blue. The new bands appeared in the cathode glow and behaved as expected. A detailed study of the excitation conditions was not made, but the best conditions seemed to be 1 mm. mercury pressure and minimum discharge current (8 m.amp.). The bands also appeared at higher pressures (3–4 mm.); though more current was needed (50 m.amp.), the flow rate was probably higher. The nitrogen second positive and first negative systems and the nitric oxide β and γ systems were also present; the nitrogen bands were of comparable intensity with the new bands and may have obscured some of them. A better separation from these emissions from decomposition products of nitrous oxide would probably be obtained at higher rates of flow.

Table 1. Wave-lengths and Intensities of the New Band System

(A.)	I	(A.)	I	(A.)	I
3380	*S*	3595	*MS*	3773	*WM*
3396	*S*	3611	*M*	3823	*M*
3429	*W*	3626	*W*	3843	*S*
3434	*W*	3636	*WM*	3864	*S*
3454	*MS*	3653	*MS*	3874	*W*
3470	*MS*	3661	*M*	3928	*W*
3481	*W*	3673	*MS*	3961	*W*
3493	*M*	3687	*VS*	3981	*W*
3516	*MS*	3706	*VS*	4008	*WM*
3521	*M*	3720	*W*	4030	*WM*
3541	*VS*	3746	*MS*	4126	*W*
3558	*VS*	3764	*WM*	4225	*W*

The band heads and estimated intensities are listed in Table 1. A number of very weak bands were also observed and probably belong to this system; the strong bands were clearly degraded to the violet. Though further evidence is required, the most likely emitter of these bands seems to be N_2O^+. Further study of them would be of interest for comparison with the isoelectronic CO_2^+ (refs. 2 and 3) and NCO (ref. 5).

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Abnormally High Fatigue Strengths in Aluminium Alloy Extruded Bar

In 1932, Matthaes[1] reported that the tension properties of aluminium alloy extrusions in the longitudinal direction were significantly greater than in the transverse direction, and it is now well known that both the ultimate tensile stress and proof stress values may be 20–30 per cent greater than the respective values for rolled or forged material. However, it has been observed[2] that the fatigue properties are little affected by the extrusion process. In view of this the following results are of interest.

Unnotched and notched rotating cantilever fatigue tests at 12,000 cycles/min. have been conducted on two batches of aluminium alloy extruded bar, one of 0·510 in. diameter to specification *S.A.A.*(*E*)2*D*.649 (24*S*-*T*) and the other of 0·750 in. diameter to specification *D.T.D*.683/3 (75*S*-*T*), both batches being of Australian manufacture.

Table 1 shows that the tension properties of both batches are far in excess of the specification properties for these alloys. Fatigue tests using specimens of 0·300 in. nominal test diameter have indicated that the materials exhibit several unusual characteristics.

In Fig. 1 are shown the mean *S*–*N* curves for specimens of the 24*S*-*T* material; these are also typical of

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