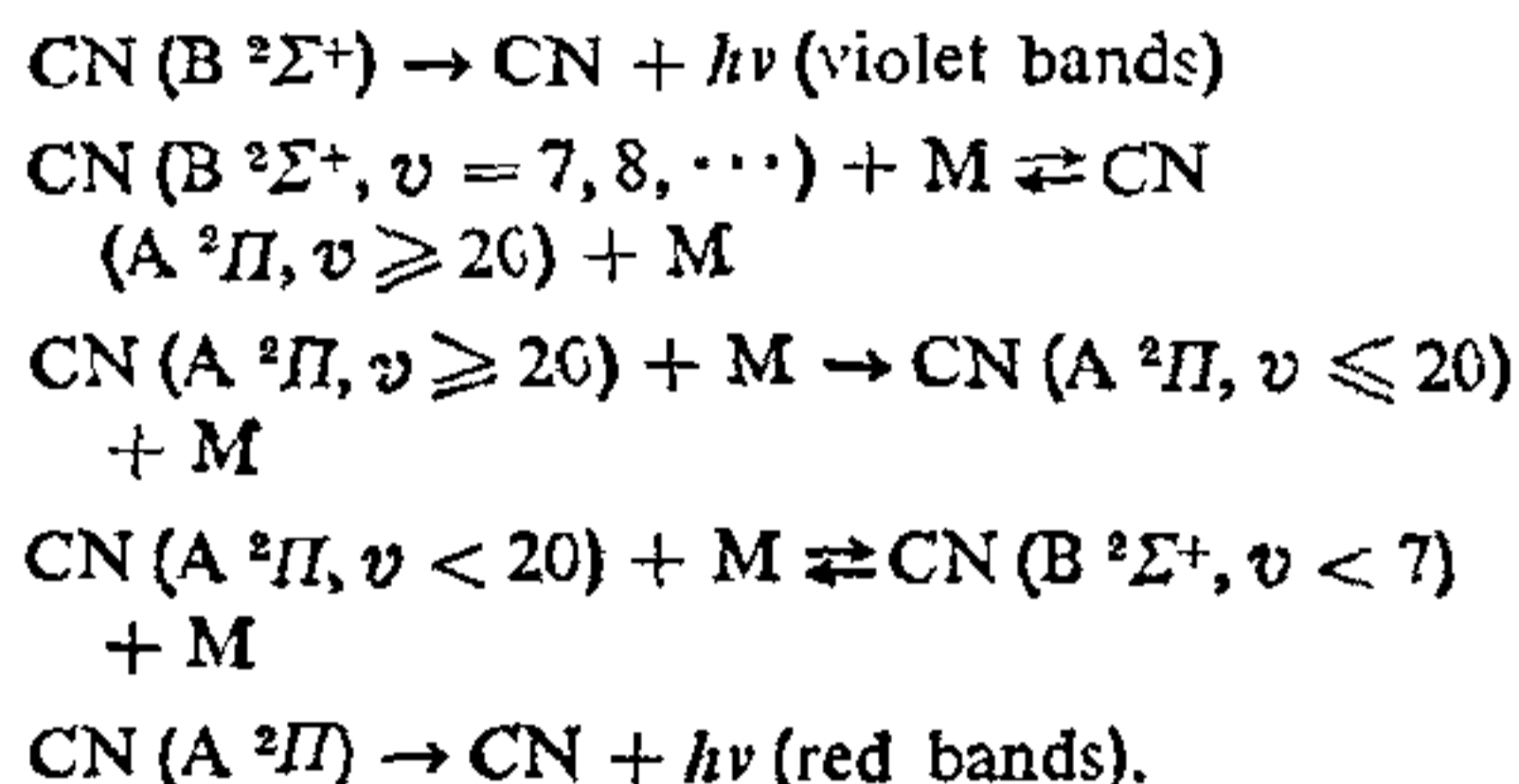


## LETTERS TO THE EDITOR

VIBRATIONAL RELAXATION  
IN CN ( $B^2\Sigma^+$ ) STATE

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CN BANDS are predominantly observed in atomic flames of nitrogen: *i.e.*, luminescent reactions of nitrogen afterglow with organic vapours say  $C_2H_2$ . When trace amounts of vapours are added these flames are blue in colour and emit intense CN-violet bands. A study of these bands has revealed an abnormal vibrational excitation in CN  $B^2\Sigma^+$  state. Iwai *et al.*<sup>1</sup> and Djuwer *et al.*<sup>2</sup> have studied this abnormal excitation which shows population inversion with maximum population at  $v' = 7-8$ . Further they have reported that this distribution is insensitive to pressure. This can be interpreted to mean that there is no vibrational relaxation in  $B^2\Sigma^+$  state. As a matter of fact, such an interpretation has been offered by Washida *et al.*<sup>3</sup> and they have suggested the following set of reactions wherein relaxation takes place through CN ( $A^2\Pi$ ) state.



However, the CN violet bands as emitted from blue flame condition have been reinvestigated by Gorbali and Savadatti<sup>4</sup>. The earlier workers had used band head intensities to represent the band intensity. Whereas, these latter authors have used integrated intensities in view of open rotational structure and the changing band shape for high  $v$ -values in CN violet bands. They find that the population distribution is not only sensitive to pressure but also the population maximum shifts to lower  $v'$ -values, from  $v' = 10$  to 7 as pressure increased from 0.5 to 30 torr. This is further substantiated in the work of Provencher and McKenne<sup>5</sup>. This is a clear indication that the vibrational relaxation does take place in  $B^2\Sigma^+$  state and there is no need for the set of reactions as proposed by Washida *et al.*<sup>3</sup>.

However, there are some perturbations in the CN, B-state which are due to the CN, A-state and hence the probability of change over from A to B, or B to A at the crossings is not eliminated.

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## ON THE D-X SYSTEM OF HgCl

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RECENT studies<sup>1-3</sup> have brought up the interesting possibility of using diatomic mercury halides as laser material for high power laser output in the visible and the ultraviolet regions of the spectrum. The relative weakness of the chemical bond in the electronic ground state of these molecules as compared to its strength in the excited states and the change in the covalent vs ionic character of the molecule as the separation between the constituent atoms changes are other features of interest in these molecules. Despite several earlier studies our knowledge about the nature and characteristic constants of the electronic states of the HgCl molecule is grossly inadequate. The present series of investigations attempt to record and analyse the rotational structure of the already known bands of this molecule in order to identify the nature of the electronic states and to fix the molecular constants. The results obtained for the D-X system are given in this note.

Three band systems namely B-X (570.0-300.0 nm), C-X (291.3-270.0 nm) and D-X (263.7-238.0 nm) are known in the spectrum of HgCl molecule<sup>4-6</sup>. It has been presumed that the D-X system corresponds to a  $D^2\Pi_{3/2} - X^2\Sigma$  transition. We have succeeded in