

to the work of Krishnamurti on the Raman spectra of crystal powders. It is nevertheless true to say that the measure of success achieved has not been very considerable.

Recently, while engaged in the investigation of the Raman spectra of some compounds of the ammonium group, I have found that by a slight modification of the usual powder method, it is possible to record the Raman spectra of solids with as much clarity and completeness as in the case of liquids. In principle, it consists in employing a strictly monochromatic beam for excitation, and absorbing this particular wave-length from the scattered light before the latter enters the spectrograph. Under the circumstances, in the ideal case, only the Raman lines would be recorded on the plate, and if the substance is free from fluorescence, the exposure can be prolonged to any extent to record the complete spectral details.

In practice, these conditions are realised to a fair degree by the use of a concentrated solution of iodine in  $\text{CCl}_4$  to filter off the incident radiation of the mercury arc, and a cell of sodium nitrite ( $\text{NaNO}_2$ ) solution in front of the slit of the spectrograph. The exciting line in this case is  $\lambda 4046$  of the mercury arc, and is subsequently absorbed by the solution of  $\text{NaNO}_2$ . The necessity for two such complementary filters will be evident from the photographs reproduced in Fig. 1, which are respectively—

- (a) the Raman spectrum of  $\text{NH}_2\text{OH}\cdot\text{HCl}$  (crystals) using the unfiltered radiations of the mercury arc ;
- (b) the Raman spectrum of  $\text{NH}_2\text{OH}\cdot\text{HCl}$  (crystals) using the mercury arc light filtered by a solution of iodine in  $\text{CCl}_4$  ;
- (c) the Raman spectrum of  $\text{NH}_2\text{OH}\cdot\text{HCl}$  (crystals) using the mercury arc light filtered by a solution of iodine in  $\text{CCl}_4$ , and placing a cell of  $\text{NaNO}_2$  solution in front of the spectrograph slit.

The duration of exposure in each case is also given against the corresponding picture. The present work clearly shows that the major cause for the fogging of the plate in the usual powder method, is not the continuous spectrum of the mercury arc light itself, but is the general illumination in the interior of the spectrograph when the intense exciting line is allowed inside.

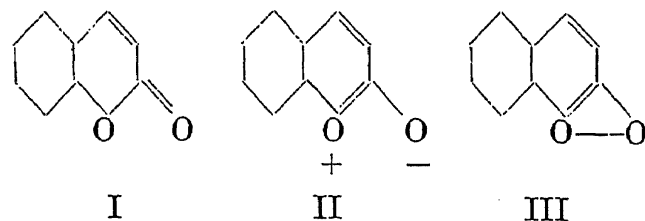
The results of the study of the Raman spectra of some typical solids by the new technique will appear shortly in the *Proceedings of the Indian Academy of Sciences*.

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### Structure of Cumarin.

IN the course of a study of the dipole moment of a series of pyrone compounds the moment of cumarin in benzene as solvent and at  $20^\circ\text{C}$ . is found to be  $4.51 \times 10^{-18}$  e.s.u. Although the actual disposition of the moment vector in the molecule has not yet been settled, its value is 0.5 units more than that calculated on the basis of the normal structure for cumarin I. As in the case of  $\gamma$ -pyrone,<sup>1</sup> this increase can be explained as due to an excited state II with which the normal molecule is in resonance.



The excited phase of the molecule will account for the several addition products of cumarin with metallic salts, the greatly depressed reactivity of the carbonyl group, and also the reduced reactivity of the ethylenic link in the pyrone ring. It can be easily seen that the excited state is but a modern version of the old Clayton<sup>2</sup> formula III, and is in consonance with the Robinson hypothesis of electromeric shift from  $\diagup\text{O}\diagdown$  to  $\text{C}=\text{O}$  such as occurs in the  $-\text{COOH}$  group.

Full details will be published in the *Proceedings of the Indian Academy of Sciences*.

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<sup>1</sup> E. C. E. Hunter and J. R. Partington, *J.C.S.*, 1934, 87.  
F. Arndt and B. Eistert, *Zeit. Physik. Chem.*, 1935, 31, 125.

<sup>2</sup> Clayton, *J.C.S.*, 1903, 93, 524.