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Raman effect in rock-salt
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Raman Effect in Rock-Salt

Born and Bradburn[1] have deduced the nature of the Raman spectrum of rock-salt to be expected on the basis of the Born lattice dynamics. They claim to have explained satisfactorily the observed features of the rock-salt spectrum reported by Fermi and Rasetti[2]. I believe that their theoretical results cannot be reconciled with the observed facts[3].

The main contention of Born and Bradburn is that in the observed spectrum the so-called Raman lines are only "small peaks on a strong background", a feature which is characteristic of the spectrum deduced from the Born dynamics. This description, which is mainly based on the microphotometer record reproduced by Fermi and Rasetti, is not justified. It is a familiar experience in microphotometry that even in the case of ordinary atomic spectra consisting of closely spaced sharp lines, microphotometric records of heavily exposed spectrograms exhibit the lines only as small kinks on a strong background. In order to gauge correctly the nature of the spectrum in such cases, it is necessary to take weakly or moderately exposed spectrograms and examine them by microphotometer. The photograph taken by Fermi and Rasetti and reproduced by Born and Bradburn itself bears testimony to the above statement. The intense Raman line with a frequency shift of 235 cm.$^{-1}$ appears only as a small peak on the Stokes side, whereas it is more prominently visible on the anti-Stokes side of the microphotometer record. It is also seen clearly as a line on the anti-Stokes side of the spectrogram and is so sharp that it may easily be mistaken for a mercury line.

The recorded Raman spectrum exhibits two prominent lines with frequency shifts 235 and 184 cm.$^{-1}$ which are recorded also in infrared absorption roughly at the corresponding positions. These lines are a characteristic feature of the rock-salt spectrum. They are, however, completely absent from the spectrum deduced on the Born lattice dynamics.

Fermi and Rasetti remark in their paper that the Raman spectrum of rock-salt terminates abruptly at 360 cm.$^{-1}$. The observations made at Bangalore also definitely confirm this result, and show that the microphotometer record beyond this point arises from a continuum associated with the mercury lines at 2561·2 and 2563·9 A. The extension of the spectrum up to 500 cm.$^{-1}$ indicated by the Born lattice dynamics thus does not find experimental support.

The Born theoretical spectrum exhibits a couple of strong peaks in the region of low-frequency shifts. Investigations carried out at this Institute definitely show that there are no corresponding bands in the Raman spectrum. The band in this region appearing in the photograph taken by Fermi and Rasetti would appear to be a spurious one of instrumental origin.

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[1] Born, M., and Bradburn, M., *Nature*, **156**, 567 (1945).
[2] Fermi, E., and Rasetti, F., *Z. Phys.*, **71**, 689 (1931).
[3] Krishnan, R. S., *Nature*, **156**, 267 (1945).