

The Internuclear Distance in Gaseous SrF

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THE dissociation energies and the ionization potentials of the alkaline-earth monofluorides have recently been measured by mass-spectrometric studies of high temperature equilibria.¹ As part of a programme on the determination of the spectroscopic properties of these molecules we have photographed some of the SrF bands in absorption under high resolution and we now report the determination of the internuclear distance in this molecule.

About 250 lines of the 0-0 bands of the $F^2\Sigma^+$

$-X^2\Sigma^+$ system have been assigned: the observation of a small perturbation in the upper state leads to an unambiguous analysis. The main results are as given in the Table.

The value of the internuclear distance in the ground state is significantly smaller than that found² in SrF₂, 2.20 ± 0.03 Å. It seems probable that the upper state is essentially a Rydberg state, and in this case the internuclear distance in the ground state of SrF⁺ may be expected to be about 1.99 Å.

TABLE

State	$F^2\Sigma^+, v = 0$	$X^2\Sigma^+, v = 0$
T_{00}	32 871.96 cm. ⁻¹	0 cm. ⁻¹
B_0	0.26966 ± 0.00005	0.24971 ± 0.00005
$10^3\alpha$ (from Pekeris' relation)	1.87	1.48
$10^7 D_0$ (observed)	2.23 ± 0.10	2.46 ± 0.10
$10^7 D_e$ (from Kratzer's relation)	2.21	2.51
$ \gamma $	0.043	~0
r_e , Å	1.997	2.0757 ± 0.0005

(Received, May 12th, 1967; Com. 461.)

¹ T. C. Ehlert, G. D. Blue, J. W. Green, and J. L. Margrave, *J. Chem. Phys.*, 1964, **41**, 2250.

² P. A. Akishin and V. P. Spiridonov, *Kristallografiya*, 1957, **2**, 475.