

subject using the empirical electro-negativity data of Pauling.

It is well known that the energy of a bond between unlike atoms is greater than the energy of a normal covalent bond between these atoms. According to Pauling the arithmetic mean or preferably the geometric mean of the bond energy values  $D(A-A)$  and  $D(B-B)$  is the energy of the ideal normal covalent bond between the atoms A and B. The additional bond energy  $\Delta AB = D(A-B) - \frac{1}{2}\{D(A-A) + D(B-B)\}$  was taken as the additional resonance energy due to the extra ionic character of the bond. In the present paper we have calculated the bond energy based upon the partial ionic character  $\Delta i = D(A-B) = (1-i)\sqrt{D(A-A) \cdot D(B-B)}$   
 $= i \frac{e^2}{r}$  where  $\frac{e^2}{r}$  is the Coulombic energy.

In Table I the values of  $\Delta i$  are calculated by using the theoretical ionic characters given by  $i = \left(\frac{Z_A}{Z_A + Z_B}\right) \times n$  which are close to the observed (cf. previous note).

TABLE I

## (A) Bond energies of homopolar bonds

Bond	Energy <sub>p</sub>	Bond	Energy <sub>p</sub>
H-H	103.4	I-I	35.4
F-F	70.0	Na-Na	18.4
Cl-Cl	56.9	K-K	12.6
Br-Br	45.2	Cs-Cs	10.1

## (B) Bond energy and partial ionic character

Bond	Distance $r_p$	Energy $D(A-B)_p$	$i$ (cal.)	Ionic binding energy	
				cal. $i \frac{e^2}{r}$	obs. $\Delta i$
HF	0.92	147.5	0.267	96.0	91.0
HCl	1.27	102.7	0.149	38.0	37.0
HBr	1.41	87.3	0.074	19.0	24.0
HI	1.61	71.4	0.049	12.0	14.0
NaCl	2.51	97.7 <sup>Pi</sup>	0.64	85.0	87.0
NaBr	2.64	88.5 <sup>H</sup>	0.64	81.0	76.0
NaI	2.90	72.9 <sup>H</sup>	0.45	52.0	55.0
KCl	2.79	101.4 <sup>Pi</sup>	0.71	83.0	97.0
KBr	2.94	91.3 <sup>H</sup>	0.70	87.0	89.0
KI	3.23	78.9	0.707	71.0	73.0
CsF	2.60	131.9	0.86	110.0	128.0
			0.91 Smyth	116.2	129.5
CsI	3.41	75.0 <sup>Sp</sup>	0.68	72.0	70.0

P—Pauling, *The Nature of the Chemical Bond*.

Pi—Pitzer, *J. Amer. Chem. Soc.*, 1948, **70**, 2141.

H—Herzberg, *Molecular Spectra and Molecular Structure*.

Sp—Sponer., *Molekulspektren*.

The agreement between the results given in the last two columns is well within the uncertainties in the values of the bond energies.

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March 5, 1949.

### ON RAPID VOLUMETRIC METHODS FOR THE ESTIMATION OF SILVER, BARIUM AND STRONTIUM IN AQUEOUS SOLUTIONS

*Determination of Silver.*—Though there are quite a number of methods for the quantitative determination of silver in aqueous solutions, a simple and rapid volumetric method has been described in this note. The method consists in the addition of a known excess of standard hydrochloric acid to a measured volume of silver solution, so as to ensure complete precipitation of silver chloride. Now, the excess of the acid remaining unused may be determined by titration against standard alkali solution using phenolphthalein as an indicator. The total amount of acid being known, the amount of hydrochloric acid reacted with silver ions may be found. The end point in this case is quite sharp and it has been found that the deviations in the results lie within permissible error. Since the solubility product of silver chloride is  $1.5 \times 10^{-10}$  at 25° C., and that of silver hydroxide at the same temperature is  $2.2 \times 10^{-8}$ , there are no chances of alkali being used up by silver chloride to form silver hydroxide.

*Determination of Barium and Strontium.*—

A similar method can be used for the estimation of barium and strontium in aqueous solutions by employing sulphuric acid for precipitating insoluble barium or strontium sulphate. The excess of sulphuric acid reacted with barium or strontium can be known. In this case too, the possibility of any reaction between the insoluble sulphate and alkali is absent, because the hydroxides of barium and strontium are far more soluble than the sulphates. It has been observed that the results

are quite satisfactory as found by actual determinations of these metals.

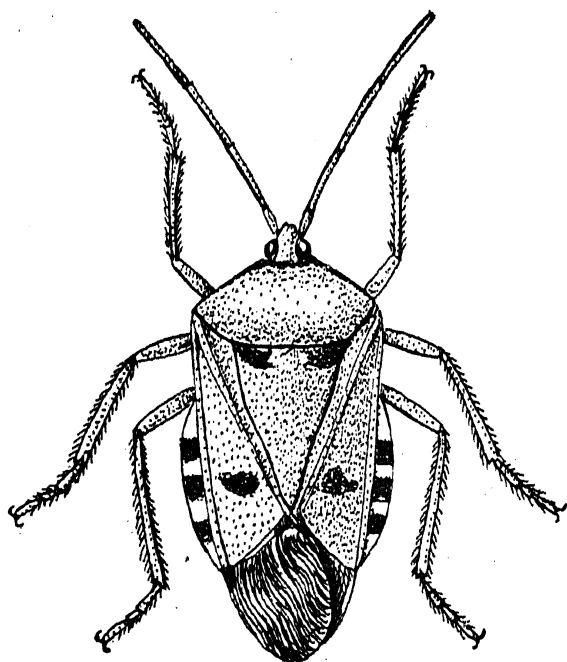
The principle involved in the above methods is well known and does not claim any originality. The methods are not intended to replace the standard methods, but can be profitably used in cases where rapid methods ensuring sufficient accuracy may be needed. It is suggested that similar methods may be applied for the volumetric determination of other metals also in aqueous solutions, which may be precipitated by acids or alkalies, remembering of course that adsorption does not play so important a role, as to interfere with the accuracy of the results obtained with the method.

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#### AN UNRECORDED INSECT PEST OF THE CASHEW TREE (*ANACARDIUM OCCIDENTALE*, L.) IN SOUTH INDIA

DURING the flowering and fruiting season of Cashew trees from November to May in 1946-47, a certain kind of bug was noticed in large numbers severely attacking Cashew trees growing along the West Coast, particularly of Travancore. As far as the writer is aware, there is no published record of these bugs on Cashew trees.



.Dorsal view of the bug

The bugs belong to the family Pentatomidæ of the order Rhynchota. Preserved

specimens sent to the Government Entomologist, Coimbatore, were identified as *Catacanthus* sp. nov., very near *Catacanthus incarnatus* Dru. belonging to the same family. The figure shows the dorsal view of the bug. In the morphological characters these bugs resemble very closely of *Catacanthus incarnatus*, except for a few minor differences. *Catacanthus incarnatus*. Dru. is not known to occur on Cashew trees, Lefroy<sup>1</sup> mentions it as an unimportant insect from an economic point of view.

The bugs seem to prefer the very young fruits and embryonic leaves. They first hover round the bunch of fruits in order to select suitable site for feeding. They suck the sap and the tender resin by thrusting their long, pointed proboscis into the fruits. At a particular place they sit and continue to suck for about a period of five to ten minutes, after which they search for a different place to feed on. On an average one bug from early morning to about 10 a.m. was noticed to alight on nearly fifteen to twenty places and makes an equal or more number of punctures. Thus the innumerable bugs puncture all the fruits and tender leaves of a tree in a very short time. On an average 1,000 to 1,500 bugs were noticed on one tree.

As soon as the proboscis of the bug is withdrawn from the fruit, the ever oozing resin and sap flow out through the puncture. Since the resin is very corrosive, as it flows over the soft and tender parts of the fruit, it corrodes the green and smooth regions of the skin. The decay of the few superficial cells of the fruit favours the growth of harmful fungi. Thus the damage of the fruits which is started by the bugs is completed by the fungi attack. Though not seriously, the leaves are also affected to some extent as a result of innumerable punctures made by the bugs. The bugs, thus, are a menace to the Cashew planters, which are reported to bring down the yield of the Cashew trees to a great extent.

Full details on the habits and biology of the bug will be published elsewhere.

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February 16, 1949.

1. Lefroy Maxwell, *Indian Insect Life*, 1909, Part II.