$$-\left(\frac{\tilde{V}^{1/3}-1}{\tilde{V}^2}\right)\ln\frac{(\tilde{V}^{1/3}-0.5)}{(\tilde{V}^{1/3}-1)}\Bigg]^{2/3} \qquad (7)$$

The sound velocity for three molten chlorides *viz* LiCl, RbCl and CsCl evaluated from (7) along with experimental sound velocity is listed in table 1. The necessary data required have been taken from the literature[14,15]. It is evident from the table that agreement between theoretical and experimental sound velocity is fairly good. The average deviations for LiCl, RbCl and CsCl are 0.47%, 2.69% and 3.19% respectively. This agreement between theory and experiment indicates that the law of corresponning state is obeyed by the molten salts which has been used as a basis in the extension of Flory's theory. The deviation follows the trend, CsCl > RbCl > LiCl which is perhaps due to a decrease in molar volume.

It may therefore be concluded that Flory's statistical

Table 1 *Theoretical and experimental sound velocity of molten chlorides, their percentage deviation at different temperatures*

T (K)	Sound velocity (experimental) (m sec^{-1})	Sound velocity (theoretical) (m sec^{-1})	$\Delta u/u$ (%)
LiCl			
901	2041	2032.2	−0.43
913	2037	2025.3	−0.57
925	2027	2021.2	−0.28
936	2016	2017.3	+0.06
948	2019	2012.3	−0.33
960	2001	2008.9	+0.34
970	1989	2000.7	+0.58
981	1972	1992.5	1.02
994	1965	1985.8	1.04
RbCl			
995	1295	1228.4	+5.42
1003	1268	1225.6	−3.46
1016	1273	1221.4	−4.22
1029	1243	1217.7	−2.07
1031	1250	1217.9	−2.63
1043	1239	1217.1	−1.79
1051	1237	1214.6	−1.84
1063	1229	1212.8	−1.33
1103	1189	1207.2	+1.50
CsCl			
927	1142	1156.4	1.24
936	1131	1155 6	2.12
947	1130	1154 1	2.08
960	1133	1152.4	1.68
972	1109	1149 8	3.54
984	1103	1146.3	3.77
993	1093	1143 6	4 42
1006	1085	1140 4	4 85
1019	1082	1139.1	5 01

theory can predict the sound velocity in molten salts like pure molecular liquids.

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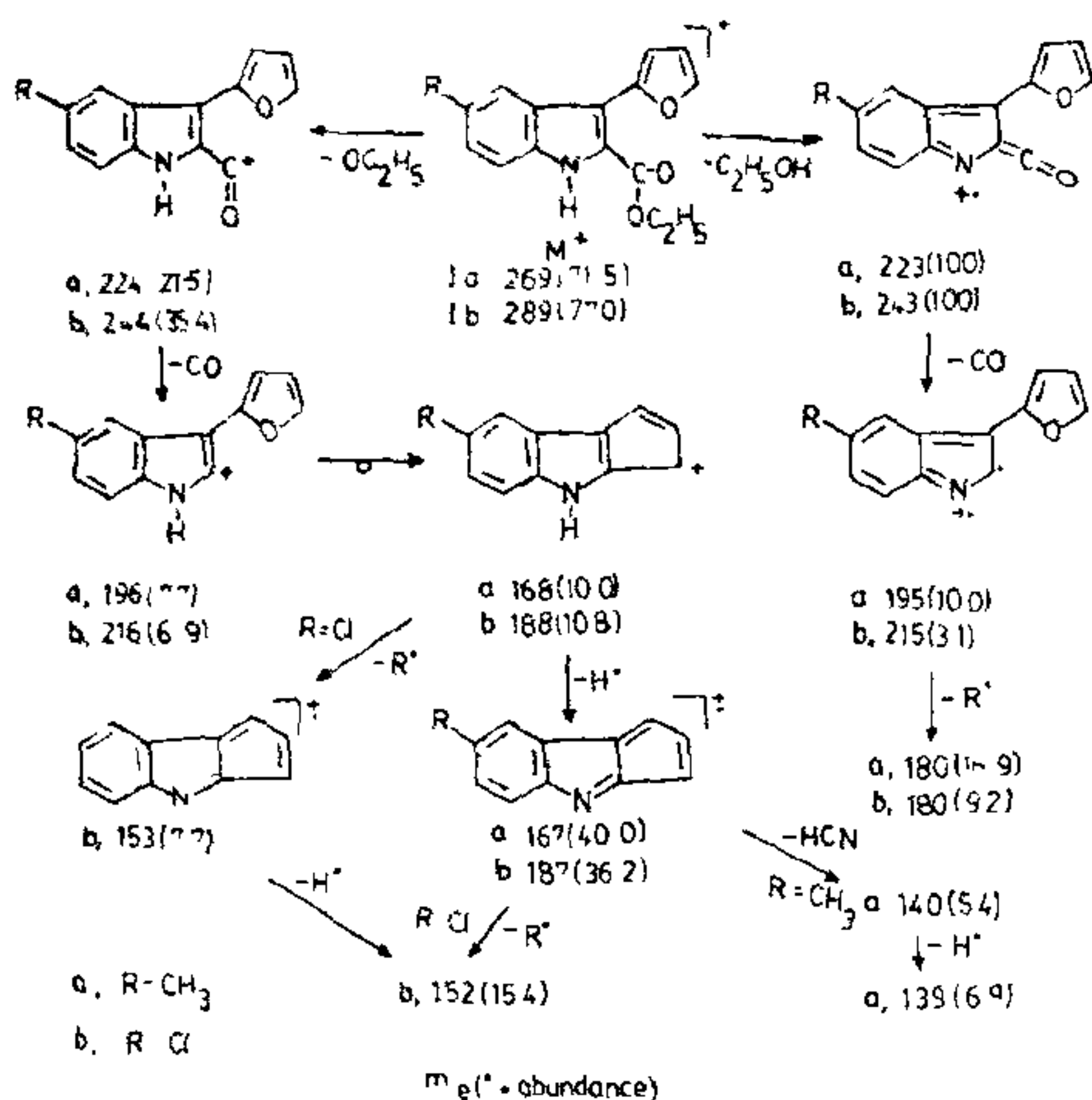
MASS SPECTRA OF 3-(2'-FURYL)INDOLE-2-CARBOXYLATES

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IN continuation of our work on mass spectra of biheterocycles[1,2] *viz.* 2-(2'-furyl)indole, 2-(2'-thienyl)indole and their derivatives, we now report the mass spectral fragmentation pattern of two typical derivatives of a new biheterocyclic system 3-(2'-furyl)indole. Ethyl 5-methyl-3-(2-furyl)indole-2-carboxylate (Ia) and ethyl 5-chloro-3-(2'-furyl)indole-2-

carboxylate (Ib) were prepared during our studies on the electrophilic substitutions of biheterocycles[3][4]. Mass spectra of (Ia,b) were recorded on Hitachi RMU-7M spectrometer. The fragments and their percentage abundance are shown in scheme-1.

SCHEME –1

In both the cases the molecular ion peak is not the base peak, but peaks at m/e 223 and 243 are the base peaks in (Ia) and (Ib) respectively, and correspond to the ions obtained by the loss of ethanol from the molecular ions of respective indoles. Half mass peaks corresponding to the doubly charged molecular ions are also seen at m/e 111.5 and 121.5. Formation of most of the fragment ions in these compounds can be rationalised by considering them as ethyl 3-substituted indole-2-carboxylates. In addition to this some of the fragment ions undergo interesting rearrangements involving the neighbouring furan ring as shown in the scheme-1.

Peaks at m/e 223 and 195 in the spectrum of indole (Ia) and 243 and 215 in the spectrum of indole (Ib) are attributed to the ions obtained by the successive loss of ethyl alcohol and carbon monoxide from the respective molecular ions. The peaks at m/e 224 and 196 in the spectrum of indole (Ia) and 244 and 216 in the spectrum of (Ib) are similarly attributed to the ions generated by the successive loss of ethoxycarbonyl radical and carbon monoxide from the respective molecular ions. These fragmentation patterns are similar to the commonly observed fragmentation

patterns of ethyl indole-2-carboxylates[5]. The ions at m/e 196 in the case of (Ia) and 216 in the case of (Ib) further lose another molecule of carbon monoxide and H⁻ to produce ions at m/e 168 and 167 in case of (Ia) and at m/e 188 and 187 in case of (Ib) *via* some rearrangements involving neighbouring furan ring.

Common ions at m/e 180, 153 and 152 arise from the loss of methyl radical from the ions at m/e 195, 168 and 167 in the case of (Ia) and by the loss of chloride radical from the ions at m/e 215, 188 and 187 in the case of (Ib). These fragmentations are analogous to the loss of H from the molecular ion of benzo (5,6) acridine[6]. The molecular ions at m/e 140 and 139 result from the loss of elements of HCN and H_2CN from the ion at m/e 167 and their formation involving considerable rupture of the molecule. Close analogies are the fragmentation of phenazines into M-HCN and M-H_2CN ions[7] and formation of M-CHS ion from the molecular ion of dibenzothiepin[8]. Although these compounds can be considered as 2-substituted furans, no characteristic fragmentations corresponding to 2-substituted furans are observed.

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