2. *2-Aryl-4-aryldene-2-imidazolin-5-ones*

Ethyl chloroacetate (24 mmol) was refluxed with potassium iodide (24 mmol) and 2-methylpropan-1-ol (5 ml) for 1 hr in a round bottomed flask. After cooling to room temperature amidine hydrochloride (15.6 mmol), sodium hydrogencarbonate (50 mmol), aromatic aldehyde (10 mmol) and 2-methylpropan-1-ol (15 ml) were added to it and again refluxed for 1 hr. The product II was filtered and washed with ethanol (3 × 10 ml), water (3 × 10 ml) and again with ethanol (10 ml) and dried in the oven.

The alkali metal iodide may be recovered from the washings and reused.

10 June 1985

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EVALUATION OF SOUND VELOCITY IN MOLTEN HALIDES AT DIFFERENT TEMPERATURES

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MANY of the physical properties of ionic liquids are similar in order of magnitude to those of other liquids and due to this molten salts and their multicomponent systems provide an important testing ground for theories of liquids and of solutions.

Various workers have computed sound velocity theoretically in molecular liquids and liquid metals using cell model theory[1], hole theory[2], hard sphere model[3], significant structure theory[4,5] and Flory's theory[6,7], but attempts to evaluate sound velocity of molten electrolytes using Flory's statistical theory are rare[8]. The aim of present paper is to extend the Flory theory to evaluate sound velocity of molten halides at different temperatures and to check the validity of the theory in molten halides.

Sound velocity (μ) and the surface tension (σ) are related by Auerbach[9] relation as

$$\mu = \left(\frac{\sigma}{6.3 \times 10^{-4} \rho}\right)^{2/3}, \tag{1}$$

where ρ is density.

According to Flory's statistical theory[10,11] the surface tension is expressed as

$$\sigma = \sigma^* \tilde{\sigma}(\tilde{v}), \tag{2}$$

where σ^* and $\tilde{\sigma}(\tilde{v})$ are the characteristic surface tension and reduced surface tension respectively. Patterson and Rastogi[12] in their extension of the corresponding state theory to deal with surface tension used the reduction parameter as

$$\sigma^* = K^{1/3} P^{*2/3} T^{*1/3}. \tag{3}$$

Here K is the Boltzmann constant.

The characteristic pressure (P^*) and characteristic temperature (T^*) are given by

$$P^* = \frac{\alpha}{\beta_T} T \cdot \tilde{V}^2, \tag{4}$$

$$T^* = \frac{\tilde{V}^{4/3} \times T}{(\tilde{V}^{1/3} - 1)}, \tag{5}$$

where T, α, β_T and $\tilde{V}$ are temperature, thermal expansion coefficient, isothermal compressibility and reduced volume respectively. Starting from the work of Prigogine and Saraga[13], they also derived a reduced surface tension equation of

$$\tilde{\sigma}(\tilde{V}) = M\tilde{V}^{-5/3} - \frac{\tilde{V}^{1/3} - 1}{\tilde{V}^2} \ln \frac{(\tilde{V}^{1/3} - 0.5)}{(\tilde{V}^{1/3} - 1)}. \tag{6}$$

In (6) M is the fractional decrease in the nearest neighbours of a cell due to migration from the bulk phase to the surface phase and has a value from 0.25 to 0.29 on the basis of closed packed lattice. Using (1) in conjunction with (2), (3) and (6) one gets

$$\mu = \left\{\frac{K P^{*2} \cdot T^*}{6.3 \times 10^{-4} \cdot \rho}\right\}^{2/9} \left[M\tilde{V}^{-5/3}\right.$$

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

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

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

15 May 1985; Revised 4 September 1985

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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-