LETTERS TO THE EDITOR

CRYSTALLIZATION AND CRYSTAL DATA OF ACETAMINOPHEN AND METAMIZOL

ACETAMINOPHEN (also known as paracetamol) and metamizol (Novalgin) are well-known pain relieving medicines. Acetaminophen is a derivative of acetanilide whereas metamizol is a pyrazole derivative. The crystallization and the preliminary X-ray study of these compounds have been carried out as part of a programme of structural investigations of analgesics and their interactions[1-3].

Large, nearly transparent crystals of acetaminophen were crystallized by slow evaporation of its solution in ethanol. Tiny, needle-like crystals of metamizol were grown by vapour diffusion with water as the solvent and ethanol as the precipitant. The space groups and the unit cell dimensions of the crystals were determined from oscillation, Weissenberg and precession photographs taken about crystallographic axes using nickel filtered copper radiation. The densities of the samples were measured by flotation method using a mixture of carbon tetrachloride and benzene. These data are given in Table I.

TABLE I
Crystal data

	Acetaminophen	Metamizol
Space group	$P2_1/c$	$P2_1/c$
a in Å	$7{\cdot}12 \pm 0{\cdot}01$	$9{\cdot}25 \pm 0{\cdot}01$
b in Å	$9{\cdot}40 \pm 0{\cdot}03$	$49{\cdot}22 \pm 0{\cdot}02$
c in Å	$12{\cdot}88 \pm 0{\cdot}03$	$7\ 32 \pm 0{\cdot}02$
β in degrees	$116{\cdot}2 \pm 0{\cdot}5$	$90{\cdot}5 \pm 0{\cdot}5$
Volume of the Unit Cell in Å^3	773·50	3332·69
Molecular formula	$C_8H_9O_2N$	$C_{13}H_{16}N_3NaO_4S$
Formula weight	151·16	333·35
No. of formula weights in the unit cell	4	8
Measured density in gm/cc	$1{\cdot}294 \pm 0{\cdot}005$	$1{\cdot}388 \pm 0{\cdot}005$
Number of solvent molecules in the unit cell	..	8 H_2O
Calculated density in gm/cc	1·298	1·400

The complete structure determination of the compounds is in progress. The authors thank Prof. *P. S. Narayanan* for his interest in the work.

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ELECTRICAL PROPERTIES OF A NEW TYPE OF $A^+B^{5+}B^{6+}O_6^{2-}$ COMPOUNDS

RECENTLY[1] the structural properties of a new type of compounds with the general formula $A^+ B^{5+}B^{6+}O_6^{2-}$, where $A^+ = Na^+$, K^+, $B^{5+} = Nb^{5+}$ Ta^{5+} and $B^{6+} = Mo^{6+}$, W^{6+} have been reported. This note summarises the electrical properties of the compositions in the above systems.

The electrical properties like dielectric constant (ϵ), loss tangent (tan δ) and room temperature resistivities (both a.c. and d.c.) were measured on 12 mm diameter, 1–2 mm thickness circular pellets by the methods described earlier[2]. The results obtained are as follows:

(1) In the system $NaNbO_3$–WO_3, compositions with 20 mole% WO_3 gave values of ϵ and tan δ ranging from 25 (ϵ), 0·12% (tan δ) for pure $NaNbO_3$ to 200 (ϵ) and 0·5% (tan δ) for 20 mole% WO_3 incorporation. The compositions are ferroelectric in this region. Appearance of a columbite phase beyond 20 mole% WO_3 incorporation results in semi-conducting properties (order of the dc resistivities 10^{-5} ohm. cm). The semiconducting properties may be attributed to either (1) the Na–Na bonding resulting from the overlapping of the sodium 3p orbitals, (2) W–W or Nb–Nb bonding from the overlapping of tungsten or niobium t_{2g} orbitals or (3) covalent bonding from a mixing of the Na p orbitals and W(Nb) t_{2g} orbitals. Further work is in progress to establish the mechanism of conduction in these compositions. Beyond 35 mole WO_3 addition it was not possible to measure the dielectric constant probably due to the enhanced conduction resulting in lossy samples.

(2) In the system $NaTaO_3$–WO_3, the values of ϵ and tan δ varied from 50 (ϵ) and 0·02% (tan δ) to 500 (ϵ) and 0·12% (tan δ) as the WO_3 concentration increased. The $NaTaO_3$ phase exists upto 50 mole% incorporation of WO_3 and shows the ferroelectric properties which tend to disappear beyond 50 mole% WO_3 incorporation. A linear relationship between T_c (transition temperature)

and mole% WO_3 addition was obtained in this series, confirming the formation of solid solutions.

(3) In the $NaNbO_3$–MoO_3 and $NaTaO_3$–MoO_3 systems the ferroelectric properties are retained upto 10 mole% and 20 mole% MoO_3 incorporation respectively. Beyond these limits, conduction is induced in these compositions. The electrical resistivity (dc) varied between 10^{-5} to 10^{-6} ohm.cm for various MoO_3 incorporations.

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OBSERVATION OF A RELATIVELY LOW APPARENT VELOCITY AND HIGH ABSORPTION LAYER AT 39·0°–40·2° EPICENTRAL DISTANCES BY USING P WAVES

ABSTRACT

A study of the travel time of first arrival P waves from underground nuclear and chemical explosions within a narrow epicentral distance range of 37·0° – 43·0°, shows the presence of a relatively low apparent velocity region at 39·0° – 40·2° epicentral distance. Amplitude absorption studies of the four events tend to show a low one cycle Q region around 40° epicentral distance.

THE first arrival P waves, irrespective of azimuth, from 18 underground nuclear explosions and one chemical explosion have been considered here for travel time studies in the epicentral distances between 37–43°. The nuclear events are from the mainland U.S.A. and Kazakh region of U.S.S.R., while the chemical one is from the offshore U.S.A. Of all the events, the travel times for four are directly read from the seismograms of the recording stations. The rest are taken from Earthquake Data Reports, supplied by the U.S. Department of Commerce, Environmental Science Services Administrations, Coast and Geodetic Survey, Rockville, Maryland, U.S.A. No correction of any sort has been applied to the data. The travel times showing Jeffreys-Bullen residuals greater than three have been rejected. Figure 1 shows the plot of travel times against the epicentral distance. This figure shows the decrease in travel times from 38·5° to 39·0° followed by an increase from 39·0° to 40·2°. Thus the region between 39·0° and 40·2° is a low apparent velocity region, the maximum decrease from the general trend taking place at 39·5°,

$dT/d\Delta$ values have been calculated from the travel time of each event and are plotted against the epicentral distance in Fig. 2. Very high or negative values of $dT/d\Delta$ are rejected. The figure shows a break in $dT/d\Delta$ values at 39°. This break in $dT/d\Delta$ values indicates the possibility of a region of velocity decrease across a discontinuity surface[1] (Bullen, p. 118). In this case the velocity decrease region is from 39·0° to 40·2°. Beyond 40·2° up to 43°, the $dT/d\Delta$ values are constant.

The absorption of the first cycle of the compressional waves for Bilby, Gnome, Shoal and Haymaker nuclear explosions arriving within the epicentral distance 32–49° have been calculated[2] within the frequency range of 0·7 to 1·0 cps, using a formula of the type

$$A_f = \epsilon A_{0f}\, e^{\frac{-\pi f r}{Q v}}. \qquad (1)$$

Here

A_{0f}, A_f = Instrument magnification corrected Fourier transformed amplitudes for source and station records respectively for frequency f,
r = distance of propagation of the wave,
v = velocity of propagation of the compressional wave,
Q = dissipation parameter for P wave,
e = includes both geometrical spreading factor and interface losses, assumed to be frequency independent.

For a narrow band of frequencies, Δf,

$$Q = \frac{\pi t \Delta f}{\Delta \log \left(\frac{A_0}{A}\right)_f} \qquad (2)$$

Here t = travel time of the compressional waves, from the source to the recording station.

The "One cycle apparent Q values" calculated from (2) are plotted against epicentral distance in Fig. 3. These plotted values are taken from reference 2. In spite of large scattering of data, a low Q or high relative absorption region centred around 40° is evident.

It should be noted that the Q computed in this way may not represent the actual Q of the source-receiver system, since the exact pulse-lengths at the source and recording stations are not known. However, they should represent relative absorption associated with the first cycle of the compressional waves at each station for every explosion. Another fact to be mentioned here is that the stations, for which Q calculations have been made, are lying in the North-East direction of the explosions,