In the present work, using columns of 'ZeoKarb 225' ('Permutit') in bead form, mixed with powdered animal charcoal, percolation of soap solutions and emulsions gave clear liquors from which organic matter had been removed. The presence of charcoal diminishes the rate of percolation that occurs with resin alone and increases the extent of adsorption : it is not yet clear whether the charcoal functions purely mechanically or as an additional adsorptive material. Preparation of the columns involves regeneration of the resin and Soxhlet extraction with the solvents to be used for elution. Percolation of the emulsion and subsequent elution with a series of solvents resulted in the isolation of the separate components. With pure soaps, over the concentration-range 0.05-0.4 per cent, elution with ethanol gave a 98-100 per cent recovery of the corresponding fatty acids; with purified, substantially acid-free lanolin, stabilized by pure soaps, ethanol elution gave a 99 per cent yield of fatty acid (calculated on the soap used), and subsequent elution with trichlorethylene gave a 99 per cent yield of lanolin. These two fractions were identified with the pure materials by means of their infra-red absorption spectra, which are characteristic. The fatty acid was also determined by alkali titration.

Under these conditions, therefore, it is possible to obtain an almost theoretical yield of the separate components quite readily. In the case of sodium cetyl sulphate, the pure material was retained on the column, but proved most difficult to remove. Eventually, it was found that elution with ethylene glycol and subsequent titration with aqueous sodium hydroxide indicated a 100 per cent yield of cetyl hydrogen sulphate (identified as cetyl alcohol after hydrolysis with hydrochloric acid). Emulsions stabilized with sodium cetyl sulphate were also estimated, the lanolin being removed from the column by trichlorethylene, and the cetyl hydrogen sulphate afterwards removed and determined as above.

This method has been extended to the analysis of emulsions of a mineral oil (Shell 'Clavus 27') and of a vegetable oil (olive oil), reproducible results being obtained. A more detailed account of the work will be published elsewhere.

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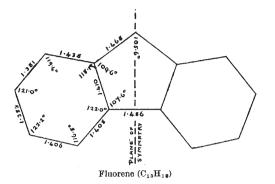
Wool Industries Research Association, Torridon, Headingley, Leeds 6.

Jan. 6.

¹ Shawcross, R., U.S. Patent 2,522,140-1950.

Molecular Structure of Fluorene

THERE has been considerable discussion during the past thirty years or so about the shape and in particular about the planarity of the fluorene molecule. If the molecule is not flat, then there is the possibility of obtaining optical isomers with unsymmetrically substituted fluorene derivatives, and some claims have been put forward that such isomers have been resolved. A qualitative estimation of the main X-ray crystal reflexions from fluorene together with optical and magnetic data led one of us some years ago¹ to the conclusion that the fluorene molecule was non-planar. The consequences in regard to optical isomerism were discussed by Cook and Iball², who gave a brief review of the literature on the subject.



We have now completed a detailed quantitative crystal analysis of this compound, including twodimensional Fourier syntheses down each of the three axes of the orthorhombic unit cell. Full details of the analysis will be published elsewhere. Here we wish to give the results in regard to the size and shape of the molecule. The accompanying figure gives the bond-lengths (A.) and the bond-angles. The mean bond-length in the benzene ring is 1.403 A. with a standard deviation of 0.007 A. The space group is Pnam, and therefore, since there are only four molecules per unit cell, the molecule possesses a plane of symmetry which coincides with the (001) plane of the crystal. The carbon atoms all lie on a plane which can be represented in the unit cell by the equation y = 1.4375x + 11.0947 (unit cell dimensions are, $a = 8.49 \pm 0.01$; $b = 5.72 \pm 0.01$; $c = 18.97 \pm 0.10$ A.). The maximum deviation of the atoms from this plane is 0.030 A.; root mean square deviation is 0.017 A. It is clear, therefore, that the molecule is planar, and unless the molecule has a different shape in solution from that which it has in the solid there can be no possibility of optical isomerism.

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University of St. Andrews, Carnegie Laboratory of Physics, University College, Dundee. Jan. 15. ¹Z. Krist., 94, 397 (1936).

² Chem. and Indust., 55, 467 (1936).

Bashforth–Adams Method for the Numerical Solution of Differential Equations

SEVERAL current text-books on numerical mathematics give descriptions of what is called the 'Bashforth-Adams' process for the solution of differential equations. The method is usually dismissed with a statement to the effect that, since it includes no adequate checking procedure, it is of little use.

Now, although this remark is true of the process envisaged by the authors of the texts, it is not true of the technique developed by Bashforth and Adams, which we can only suppose has been successively retranscribed from some incorrect secondary source by later writers.

To set the matter right, it was thought worth while to publish the following brief note. Page