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Crystallographic studies on sodium uranyl-8-quinolinate, $Na.UO_2.(C_9H_6NO)_3$.

By V. Amirthalingam, *Chemistry Division, Atomic Energy Establishment, Trombay, Bombay, India*

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Sodium uranyl-8-quinolinate was prepared by the action of uranyl nitrate on sodium carbonate and 8-quinolinol (Bullwinkel & Noble, 1958). The orange precipitate so obtained was repeatedly washed with sodium carbonate and dried. It crystallises as tiny and highly brittle orange-colour needles from water-alcohol mixture. The crystals belong to the monoclinic system, elongated parallel to *c*. The density of the compound was determined by using aqueous K_2HgI_4.

Rotation and Weissenberg layer-line photographs about the *b* and *c* axes were taken with Cu $K\alpha$ radiation and the cell dimensions were determined as

$$a = 22{\cdot}41,\ b = 14{\cdot}42,\ c = 13{\cdot}72\ \text{Å};\ \beta = 98°\ 30'.$$

There are eight molecules in the unit cell ($\varrho_c = 2{\cdot}23$ g.cm.$^{-3}$, $\varrho_o = 2{\cdot}20$ g.cm.$^{-3}$).

The systematic absences found were *h*0*l*, *h* odd and *l* odd; and *hk*1, $h+k$ odd; these fix the space group as C_{2h}^6–$C2/c$.

Intensity data for the *h*0*l* and *hk*0 reflections were collected by visual estimation. Patterson projections on (001) and (010) gave the uranium and sodium coordinates. The ambiguity in the coordinates was solved by packing considerations. A preliminary Fourier projection on (001), computed with the signs obtained from the uranium position, showed considerable overlapping of the lighter atoms around uranium and hence further work to locate these atoms was abandoned.

The coordinates of uranium and sodium are as follows:

	x	*y*	*z*
U	0·196	0	0·133
Na	0·400	0	0·350

I am grateful to Dr J. Shankar for his keen interest during the progress of the work.

Reference

Bullwinkel, E. P. & Noble, P., Jr. (1958). *J. Amer. Chem. Soc.* **12**, 2955.

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A. J. C. Wilson, Department of Physics, University College, Cathays Park, Cardiff, England). As far as practicable books will be reviewed in a country different from that of publication.

Application of Finite Groups.

By J. S. Lomont, Pp. xi + 346. New York: Academic Press, 1959. Price $11·00.

This book is a welcome addition to the growing collection of literature which explains the basic aspects of group theory to physicists and chemists, points out where these concepts can be usefully applied, and gives some examples of actual applications. The present book differs from most of the others in this category by the inclusion of considerably more advanced group theoretical concepts and techniques. This may take its study somewhat more difficult for people who are unfamiliar with mathematical reasoning, but the reviewer feels that the necessary effort would be well worthwhile.

The choice of the range of examples to illustrate physical applications of group theory is always a difficult one: too small a number does not do justice to the wide range of applicability of the discipline; too wide a choice creates the danger that the possibilities will be simply enumerated without detailed discussion. The author has found a felicitous middle ground which enables him to treat quite a variety of subjects in a rather thorough fashion. Most of the illustrations are well chosen in that they exhibit the power of group theory to simplify a wide range of problems although in at least one case (thermodynamics) results are obtained by the use of heavy group theoretical artillery that can be obtained rather simply without it.

Chapter I presents, in the form of definitions and theorems, all the necessary (and some unnecessary) matrix theoretical background for the later exposition of representation theory; a large amount of material is compressed here into 15 pages. This condensation is achieved in part by good organization and in part by the complete omission of all proofs, save one (Schur's Lemma) which is given in brief outline. This absence of proofs may be considered a drawback by many, while others may find that being forced to supply them constitutes a very worthwhile exercise; in any case, specific references to where the proofs of at least the most important theorems could be found would be helpful.

Chapter II (27 pages) gives the most important concepts of abstract group theory again mainly in the form of definitions and theorems (without proofs). An unusual and welcome feature is the inclusion of some more advanced and 'modern' concepts, e.g. that of the semi-direct product, as well as some 'classical' ones like composition series and group commutators. The quaternion group is used as a concrete example to illustrate various features, a welcome departure from the almost traditional use for these purposes of the symmetric group of degree 3. This chapter also contains applications to thermodynamics as well as the beginning of a discussion of