LETTERS TO THE EDITOR

ANGULAR CORRELATIONS IN ^{177}Hf

THE decay of ^{177}Lu was studied earlier, and it was established that levels in ^{177}Hf at energies 113, 250 and 321 keV were populated in the decay. The ground, 113 and 250 keV states, were assumed to form one rotational band, while the 321 keV state was an intrinsic state. The decay of the 321 keV state to the lower energy states is therefore of interest from the viewpoint of Nilsson[1] model. Since the transitions depopulating the 321 keV state are all of the hindered E 1 type, it is of interest to accurately estimate the M 2 content. A number of angular correlation studies[2-4] were carried out on the 208–113 keV cascade. Since there are uncertainties in the earlier measurements[2-4] a reinvestigation is undertaken using a sum-coincidence spectrometer[5]. The conversion coefficient of the 113 keV transition is also experimentally determined using the X-ray-gamma coincidence method.

The sum-coincidence spectra with gate at 321 keV are recorded on the Nuclear Data 512-Channel Analyser at angles 90°, 135° and 180° between the detectors. At each angular position a minimum of 10,000 counts are collected under the peaks at 113 and 208 keV. The resultant angular distribution is fitted to a polynomial and the resultant correlation coefficient corrected for finite detector size effects is obtained as

$$A_2 = 0{\cdot}12 \pm 0{\cdot}01.$$

The gamma-ray spectrum in coincidence with the K-X-ray of ^{177}Hf is recorded on a Nuclear Data 512-Channel Analyser and the intensity under the 113 keV peak is used to estimate the K-conversion coefficient of the transition as

$$\alpha_k = 0{\cdot}95 \pm 0{\cdot}02$$

Using the theoretical conversion coefficient for M 1 and E 2, the quadrupole content on the 113 keV transition is estimated to be $(87 \pm 1)\%$. The correlation coefficient with this value of quadrupole content for the lower gamma-ray is estimated and employed to analyse the experimental angular correlation coefficient for the cascade to yield the quadrupole content of the 208 keV transition to be $(7 \pm 2)\%$. This value is, however, inconsistent with the earlier estimates from the conversion coefficient of the 208 keV transition. It will be, therefore, of interest to undertake detailed conversion measurements for all the transitions depopulating 321 keV state.

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AN X-RAY EXAMINATION OF A CRYSTALLINE COMPLEX BETWEEN CYTIDINE MONOPHOSPHORIC ACID AND ARGININE

ASSOCIATION between proteins and nucleic acids occurs extensively in biological systems. The DNA-histone complex in chromatin is perhaps the best-known example of this type of association. The assembly of ribosomal proteins and RNA provides yet another example. In spite of the fundamental importance of nucleoprotein systems in biology, the nature of the interactions that give rise to them is still largely unknown. One method of approaching this problem is through the study of molecular associations in systems consisting of the monomeric units of proteins and nucleic acids. Therefore, a programme of X-ray crystallographic and other structural investigations on the molecular complexes between amino acids and nucleic acid components has been initiated. The results of a preliminary X-ray study of a 1 : 1 crystalline complex between cytidine monophosphoric acid (CMP) and arginine, carried out as part of this programme, are reported here.

Transparent plate-like crystals of the complex were grown by evaporating a solution consisting of the disodium salt of CMP and arginine hydrochloride in molar proportions with a mixture of water and acetone as solvent. The composition of the crystals was confirmed by ultraviolet spectral analysis and amino acid analysis carried out respectively by Drs. S. K. Poddar and Paul Vidayathyl of the Biochemistry Department of this Institute.

The crystal data of the sample determined from oscillation, Weissenberg and precession photographs taken about crystallographic axes using copper radiation together with the density measured by flota-

tion in a mixture of acetone and bromoform are given below.

Space group	$P\,2_1 2\,2_1$
$a = 8{\cdot}89 \pm 0{\cdot}02$. $b = 11{\cdot}84 \pm 0{\cdot}02$. $c = 21{\cdot}41 \pm 0{\cdot}02$ Å.	
Volume of the unit cell	2253·57 Å ^{3}.
Measured density	1·576 ± 0·005 gm/cc.
Calculated density for four molecules of CMP, four molecules of arginine and eight water molecules in the unit cell	1·572 gm/cc.

It may be mentioned that the unit cell might contain four chloride ions or four sodium ions and four water molecules instead of the eight water molecules indicated above. These possibilities cannot be distinguished at this stage from the crystal data.

The complete structure determination of this complex and also the crystallization and X-ray analysis of other complexes involving nucleic acid components and amino acids are in progress.

The authors wish to thank Drs. S. K. Poddar and Paul Vidayathyl for help in confirming the composition of the crystals.

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STRUCTURE OF PHTHALAMIC ACIDS FROM 4-SUBSTITUTED PHTHALIC ANHYDRIDES AND AROMATIC AMINES

Abstract

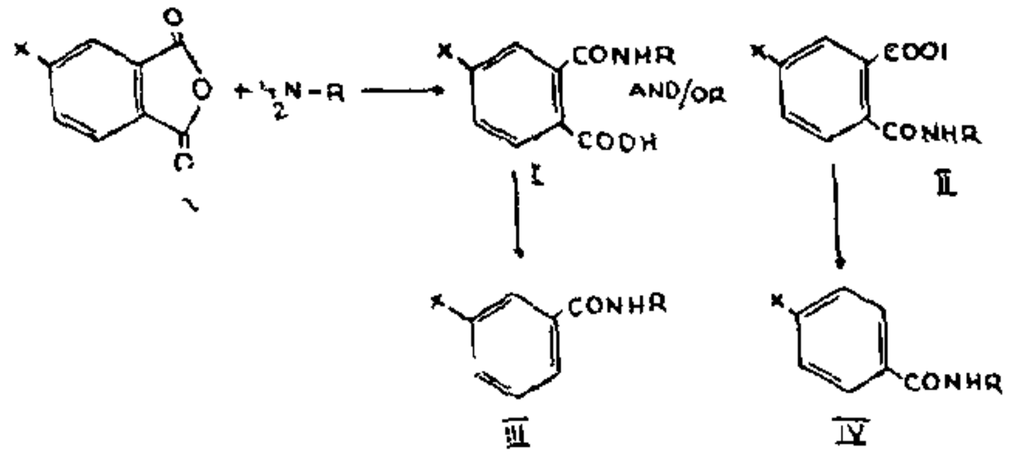
The Phthalamic acids obtained directly from 4-nitro and 4-chlorophthalic anhydrides and aniline in cold benzene medium have been characterised as 4-nitro and 4-chloro-N-phenyl phthalamic-2-acids respectively by way of decarboxylation and identification of the resulting *p*-substituted benzanilides.

During our investigations on the synthesis of phthalamic acids as plant growth substances, we had occasion to condense 4-nitro and 4-chlorophthalic anhydrides with aromatic amines. The corresponding phthalamic acids were obtained directly in quantitative yields, when the reaction was carried out in cold benzene medium. These compounds were soluble in dilute sodium bicarbonate solution and could be reprecipitated by acidification.

The phthalamic acid obtained from a 4-substituted phthalic anhydride and an aromatic amine may have the structure I or II or a mixture of both.

As representative cases the structures of phthalamic acids obtained from 4-nitro and 4-chlorophthalic anhydrides and aniline have been determined by decarboxylation method as in the case of 3-nitrophthalamic acids[1].

The phthalamic acid (m.p. 140°) obtained from aniline and 4-nitrophthalic anhydride has been decarboxylated by copper oxide and quinoline to give a pure product after crystallisation from benzene. It was found to be identical with *p*-nitrobenzanilide. Accordingly this phthalamic acid is assigned 4-nitro-N-phenyl phthalamic-2-acid (II; $X = No_2$, $R = Ph$) structure.



Decarboxylation of the phthalamic acid (m.p. 139°) obtained from 4-chlorophthalic anhydride and aniline yielded a colourless crystalline compound, identified as *p*-chlorobenzanilide. Based on this observation this phthalamic acid has been assigned 4-chloro-N-phenyl phthalamic-2-acid structure (II; $X = Cl$, $R = Ph$).

In 4-nitrophthalic anhydride, the carbonyl group para to nitro is more reactive and thus is the site of attack by aniline, leading to the formation of 4-nitro-N-phenyl phthalamic-2-acid. The inductive effect of the chloro group in 4-chlorophthalic anhydride appears to be responsible for the formation of 4-chloro-N-phenyl phthalamic-2-acid by reaction with aniline.

On the basis of the above observations, the phthalamic acids obtained from various aromatic amines and 4-nitro and 4-chloro-phthalic anhydrides have been assigned similar structures (II; $X = No_2$ or Cl).

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