

SHORT SCIENTIFIC NOTES

Shell Wise Photoelectric Cross-Sections of Gamma Rays at 145 KeV

EVENTHOUGH systematic studies are available on the total as well as on the K-shell photoelectric cross-sections of gamma rays at low energies, no studies on the higher shell cross-sections are made so far. Only recently from these laboratories studies on the higher shell cross-sections are reported¹ in high Z elements only. In the present investigations results on the higher shell cross-sections in medium and high Z elements at a typical energy 145 keV where no data is available so far are reported using the same method reported earlier¹.

The total gamma ray cross-sections at 145 keV in Ag, Sn, Ta and Pb are measured on a good geometry set-up using a ¹⁴¹Ce source. The total photoelectric cross-sections are obtained by subtracting the other theoretical partial cross-sections recently reported by Storm and Isreal², from the measured total gamma ray cross-sections. Utilising these, the shell cross-sections are obtained using the total to shell ratios already reported³. In the case of Ag and Sn the total to L-shell ratio is derived from the reported experimental K to L-shell and Total to K-shell ratios ($9.96 \pm 14\%$)^{4,5}. The obtained shell wise photoelectric cross-sections are given in Table I along with the theoretical values⁶. It can be seen that the agreement between theory and experiment is satisfactory.

TABLE I

Shell photoelectric cross-sections in barns per atom

Element		K-shell	L-shell	M-shell
Ag	Expt.	64 ± 3	7.5 ± 1.2	..
	Theo.	65	7.9	..
Sn	Expt.	81 ± 4	9.5 ± 1.4	..
	Theo.	85	10.4	..
Ta	Expt.	360 ± 14	65 ± 8	15.6 ± 3
	Theo.	346	61	14.6
Pb	Expt.	543 ± 21	100 ± 8	24 ± 4
	Theo.	550	104	25

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The Laboratories for
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Andhra University,
Waltair, May 22, 1972.

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K. PARTHASARADHI.

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5. Davisson, C. M., *Alpha, Beta and Gamma Ray Spectroscopy*, Ed. K. Siegbahn, North Holland Publishing Co., 1965.
6. Schmickley, R. D. and Pratt, R. H., *Tables of Calculated Photoelectric Cross-Sections for Energies 10 to 3,000 keV*, Lockheed Palo Alto Research Laboratories, 1967.

Hydrogen Bond Formation Between Dioxane and Water

Arefev and Malyshev¹ have reported the formation of H-bond between hydrogen chloride and oxygen carrying substances such as dioxane, acetone and ethyl ether. They have reported a shift of 430 cm⁻¹ in the infrared absorption peak of HCl gas in carbon tetrachloride at 2881 cm⁻¹, when mixed with dioxane.

The authors have recorded the Raman spectrum of dioxane in a mixture of dioxane and HCl gas in carbon tetrachloride. While the single frequency of HCl is not available for study by Raman Effect, no shift has been observed in any of the Raman lines of dioxane in the mixture. The infrared spectra at different concentrations of dioxane and HCl gas in carbon tetrachloride were carefully recorded on Model 21 Perkin-Elmer with NaCl optics. The authors failed to detect any shift in any of the dioxane peaks in the IR spectra.

We have also not recorded the infrared peak of HCl gas in carbon tetrachloride, probably because the HCl gas ionises in carbon tetrachloride². This is partly borne out by the NMR spectrum of HCl gas in carbon tetrachloride recorded by the authors.

In view of the negative evidence adduced on the basis of the experimental work by the authors, there is a likelihood of H-bond formation between water and dioxane and not between HCl gas and dioxane. Raman spectra of mixtures of dioxane and hydrochloric acid were recorded and the variations in the different frequencies are tabulated below. With a view to get confirmatory evidence, Raman spectrum of a mixture of dioxane and water has been recorded. All the Raman spectra were recorded with Fuess spectrograph having a dispersion of 19 Å/mm in the λ 4358 region. In view of the fact that hydrochloric acid has 1/3 of water by volume, the mixture used for record-

1. Ramana Rao, P. V. and Parthasaradhi, K., *Curr. Sci.*, 1972, **41**, 135.

ing the Raman spectrum had the same ratio of water by volume. The variation in the frequencies have been strikingly found of the same order (Table I), indicating that H-bond is formed

TABLE I

	ν_{dioxane} cm^{-1}	$\nu_{\text{diox.}} + \text{HCl}$ (acid) cm^{-1}	$\Delta \nu$ cm^{-1}	$\nu_{\text{diox.}} + \text{water}$ cm^{-1}	$\Delta \nu$ cm^{-1}
1.	836	824	12	819	17
2.	1075	1095	20	1102	27
3.	1128	1151	23	1160	32
4.	1197	1220	23	1227	30

between water and dioxane and not between HCl gas and dioxane.

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Hyderabad, May 9, 1972.

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1. Arefev, I. M. and Malyshev, V. I., *Optics & Spectroscopy*, 1962, 12, 112.
2. James, H. Hibben's, *Raman Effect*, 1939, p. 355.

A Method for Preserving the Strength of Iron(II) Titrant

Ferrous ammonium sulphate, $\text{Fe SO}_4 (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}$ (Mohr's salt) is one of the most commonly used reductimetric reagents. However, in solution iron(II) undergoes slow atmospheric oxidation¹ and this necessitates the frequent standardisation of ferrous solutions before use. Duke², Erdey *et al.*³ and Flaschka⁴ suggested different types of reductors to be used for reducing the iron(III) formed in storage.

In their studies⁵ on photometric titrations using iron(II) as titrant the authors realised the need for a simpler method for eliminating the frequent checking of the strength of the titrant. The procedure finally adopted was to add about 10 g of cadmium powder (about 20 mesh B. S. S.) for every litre of iron(II) solution prepared. The metal powder was cleaned from surface contamination by keeping in 2 N sulphuric acid for at least 12 hours. After washing and air drying it was added in the bottle containing ferrous solution which was 0.5 N in sulphuric acid. Every time before use, the stoppered bottle was shaken mechanically for about 10 minutes. For handling larger volumes of solutions, a glass or Teflon clad magnetic stirring bar is left in the solution and the bottle is kept for 10–15 minutes on the magnetic stirrer. Cadmium was found to reduce any iron(III) formed. The rate of dis-

solution of cadmium at the acid concentration specified is low.

A 3 liter batch of 0.2 N ferrous ammonium sulphate (0.5 N in sulphuric acid) to which 30 g cadmium powder was added, was used as a titrant for over a period of 150 days without any apparent decrease in titre. The normality, as determined by titration against weighed aliquots of pure potassium dichromate, was 0.2045 ± 0.0005 over this period. The agitation of contents for reduction of iron(III) was carried out only once in a working day. A similarly prepared solution but without the addition of cadmium showed a variation in normality from 0.2036 to 0.1494 in the same period.

Cadmium with standard redox potential $\text{Cd}^{2+} + 2e \rightleftharpoons \text{Cd}$. . . -0.40 V and slow rate of dissolution in 0.5 N sulphuric acid was convenient to use. The authors feel that the method suggested is simple and can be adopted where ferrous solutions are used routinely for titrations.

Bhabha Atomic Res. Centre, S. SYAMSUNDER.
Trombay, Bombay-85, T. K. S. MURTHY.
May 11, 1972.

1. Kolthoff, I. M. and Belcher, B., *Volumetric Analysis*, Interscience Publishers, Inc., New York, 1957, 3, 602.
2. Duke, F. R., *Ind. Eng. Chem. Anal. Ed.*, 1945, 17, 530.
3. Erdey, L. *et al.*, *Acta Chim. Sci. Hung.*, 1955, 7, 287.
4. Flaschka, H., *Anal. Chim. Acta*, 1950, 4, 242.
5. Syamsundar, S., "Studies in photometric titrations: Iron (II) as titrant," *M.Sc. Thesis*, University of Bombay, 1970.

Axially Symmetric Electromagnetic Fields in General Relativity

In General Relativity axially symmetric fields have been studied for a long time. Weyl introduced canonical coordinates which brought about considerable simplification in the study of the field equations. Since then those coordinates have been freely used.

While trying to obtain exact solutions of the Einstein-Maxwell field equations in vacuo corresponding to the axially symmetric metric in canonical coordinates in the form

$$ds^2 = e^{2\lambda} (d\rho^2 + dz^2) - \rho \cos \theta e^{2\mu} d\phi^2 - \rho \cos \theta e^{2\mu} dt^2 + 2\rho \sin \theta d\phi dt$$

where λ , μ and θ are functions of ρ and z only, we have come across the following interesting result:

If we want to solve the field equations with only one component $F_{12} = -F_{21}$ of the electromagnetic

field tensor F_{12} , then the field equations require that $F_{12} = 0$. This means that we cannot have a solution corresponding to a magnetic field in the z -direction.

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New Generic Names for Some Snakes of the Families Colubridae and Elapidae (Reptilia: Serpentes)

Malcom Smith's (1943) fauna volume on snakes continues to be the authentic source. However, since its publication the nomenclature and classification of Indian Snakes has undergone certain radical changes some of which that have come to the notice of the author are given below.

The Diadem snakes (*Coluber diadema* Schlegel and *C. diadema* var. *articeps* Fischer) are now included in the genus *SPHALEROSOPHIS* Jan. Marx (1959) recognised six forms under this genus.

The Dark-Headed Dwarf Racer *Contia persica* is now separated from the genus *CONTIA* by Stickel (1951) and included in the genus *EIRENSIS* Jan.

The generic name *XENOCHROPHIS* Gunther is used for the checkered Keel Back *Natrix piscator* (Sch.) instead of *NATRIX* which is synonymised. Malnate and Milton (1965) united the genus *XENOCHROPHIS* with *FOWLEA* which had previously been separated from *NATRIX* by Malnate (1960). The striped Keel Back [*Natrix stolata* (Linn.)] is now transferred to the genus *AMPHIESMA* Dumeril and Bibron which was separated from *NATRIX* by Malnate (1960).

It may also be noted that the King cobra is now appropriately referred to as *Ophiophagus hannah* (Cantor), the generic name indicating its snake-eating habit.

Southern Regional Station,
Zoological Survey of India,
Madras-4, May 18, 1972.

T. S. N. MURTHY.

1. Malnate, Edmond, V., *Proc. Acad. Nat. Sci. Philadelphia*, 1960, 112, 41, Fig., Maps.
2. Marx, Hyman, *Fieldiana, Zool.*, 1959, 39, 347, Figs. 58-59.
3. Stickel, William, H., *Herpetologica*, 1951, 7, 125.
4. Smith, Malcolm, *The FBI Reptilia and Amphibia*, London, 1943, 3, Serpentes, pp. xii+583, Figs., Maps.

Some Additions to Indian Fungi

More than 100 species of fungi were isolated during a survey of the rhizosphere microflora associated with fifteen medicinal plants common to Bhagalpur (Bihar) and its suburbs. Isolations were made by serial dilution technique¹ and soil plating method², using Czapek-Dox agar, Martin's Rose Bengal-streptomycin agar and potatodextrose-agar. A scrutiny of the list of fungi in recorded literature indicated that eight fungal species obtained by the authors were new records from the country, and these are tabulated below:

Names of fungi	Plants from which isolated
1. <i>Acremonium killiense</i> Grutz (IMI No. 163122)	<i>Cassia occidentalis</i> L.
2. <i>Acrophialophora levis</i> Samson and Mahmood (IMI No. 163145)	<i>Boerhaavia diffusa</i> L.
3. <i>Coniothyrium euphorbiae</i> (Roum.) Berl. and Vogl. (IMI No. 163110)	<i>Euphorbia thymifolia</i> L.
4. <i>Fusarium fusarioides</i> (Frag. and Cif.) Booth (IMI No. 163132)	<i>Cassia tora</i> L.
5. <i>Paecilomyces terricola</i> (Miller, Giddens and Foster) Onions and Barron (IMI No. 163144)	<i>Argemone mexicana</i> L.
6. <i>Penicillium emersonii</i> stolk (IMI No. 163127)	<i>Cassia tora</i> L.
7. <i>Phialophora cyclaminis</i> B yma (IMI No. 163143)	<i>Sida rhombifolia</i> L.
8. <i>Trichoderma aureoviride</i> Rifai.agg. (IMI No. 163121)	<i>Aloe barbadensis</i> Mill.

(All these fungi have been deposited in the Commonwealth Mycological Institute, Kew, England.)

Sincere thanks are due to Dr. Anthony Johnston, Director, C.M.I., Kew, England, for confirming some of the identifications.

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1. Waksman, S. A., *Principles of Soil Microbiology*, Bailliere Tindall & Co., London, 1927.
2. Warcup, J. H., *Nature*, 1950, 166, 117.

Fluorine Bearing Water from Virpapura and Kalkeri, Dharwar District, Mysore State

On south-west of Mundargi town about 7 and 9.6 kms away lie the villages Kalkeri and Virpapura respectively. The country rock is quartz diorite. The depth of weathering of the country rock varies from place to place as observed in some well sections.

The water samples are collected from 14 draw wells, 1 artificial spring, 3 streams and 4 ponds. The fluorine content of these samples is determined after Scott-Sanchis Zirconium-Alizarin colorimetric method and is found to vary from 0.3 to 9.0 ppm. A very high content of fluorine is recorded from the hornblende and biotite mica of the country rock. The pH of the water varies from 7.6 to 7.8 but exceptionally high value of 9.4 is recorded for water from an abandoned well near Kalkeri. The electrical conductance of water varies from $1000 \times 0.64 \times 0.829$ to $1000 \times 2.8 \times 0.892$ mhos.

The very fact that fluorides are absent in the country rock rules out the possibility of fluorine being derived from the fluorides. The hornblende and biotite mica contain fluorine, usually substituted for hydroxyl group. These minerals on partial alteration might have released fluorine in addition to other ions. This assumption has been substantiated by conducting leaching experiments on the country rock in Soxhlet apparatus at various intervals of time. From these experiments it could be concluded that the release of fluorine is proportional to the time. Therefore, it appears that the fluorine in the water under study is mainly due to the alteration of hornblende and biotite mica. However, apatite as a source of fluorine is not ruled out.

From the field and laboratory investigations of the water of this area the following conclusions could be drawn :

1. The fluorine content of the water in the wells gradually increases from Mundargi towards Virpapura.
2. About 1.5 kms west of Virpapura, schistose formation trending N.N.W-S.S.E. is exposed. This formation appears to have acted as a barrier preventing fluorine from migration and at the same time facilitating the enrichment of the same at and around Virpapura.

3. The fluorine content in different samples of water is not uniform. The well water in general contains more fluorine than those of the surface waters.
4. The depth of the well has no bearing on the fluorine content.
5. Water of such of the wells sunk on highly weathered rocks contains more fluorine than from those sunk on less weathered rocks.
6. It appears from the present investigation that no relation could be established between the values of fluorine content and the chemical features like pH, hardness, electrical conductance and chlorides of the water.

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Dept. of Geology,
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ANNOUNCEMENTS

Award of Research Degrees

Utkal University has awarded the Ph.D. degree in Physics to Shri Sharat Chandra Misra.

Sri Venkateswara University, Tirupati, has awarded the Ph.D. degree in Chemistry to Shri M. Chandraiah Chowdary.

Indian Society For Plantation Crops : National Symposium on Plantation Crops

The Indian Society for Plantation Crops was founded in October, 1971. The object of the Society is to promote and foster the study of plantation crops. This it does mainly by publication of "Journal of Plantation Crops" every quarter and by holding symposia on plantation crops.

Details of membership, etc., may be obtained from : The Secretary, Indian Society for Plantation Crops, Central Plantation Crops Research Institute, Kasaragod-4, Kerala, India.

A National Symposium on Plantation Crops will be held at Trivandrum during the second week of December, 1972. Papers proposed to be presented in the symposium should reach the Convener, on or before 31st July 1972.