

driving force, during the filling of smaller cavities, will be greater than during the filling of bigger cavities. Hence the more rapid filling of smaller cavities than of bigger ones. In fact in big cavities of microscopic dimensions, the effective driving pressure falls off, and becomes negligible during the last stages of sorption and in consequence the rate of filling of the cavities that are yet partially filled becomes extremely slow. Silica gel containing much smaller cavities than the other gels is filled up more quickly and the rate of sorption of water on silica gel is very large compared with those on other gels. There are yet certain unsolved problems, such as the shape of the cavities in gels, the total number of cavities, the number of cavities having particular neck and body-diameter and these problems await solution.

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¹ McBain, *J. Amer. Chem. Soc.*, 1935, 57, 699.

² Rao, K. S., *Curr. Sci.*, 1940, 9, 68.

³ ———, *Ibid.*, 1939, 8, 546.

⁴ ———, *Ibid.*, 1939, 8, 256; 1940, 9, 19.

⁵ Rao, B. S., and Doss, K. S. (G.), *J. Phys. Chem.*, 1931, 35, 3486.

⁶ Rao, K. S., and Rao, B. S., *Proc. Ind. Acad. Sci.*, (A), 1936, 4, 562.

⁷ McBain, *The Sorption of Gases and Vapours by Solids*, George Routledge & Sons, Ltd., London, 1932, 435.

A Rapid Volumetric Procedure for Analysis of Lead-Tin-Antimony Alloys

The methods described in the literature for the analysis of such alloys are tedious and often require special apparatus.

The following procedure developed in these laboratories has been found to be convenient and rapid.

The lead content of the alloy is estimated as follows: The precipitate of lead sulphate obtained according to the usual procedure is digested with a known excess of 0.5 N solution

of sodium carbonate, to effect its decomposition. The amount of sodium carbonate used up is ascertained by titration of the filtrate with standard HCl. The procedure suggested by Tananæff¹ was modified for the above purpose, and estimating lead whether in the presence or absence of tin and antimony could be carried out with good results as can be seen from the table.

Of the various methods available for estimation of antimony the potassium bromate method was found to be the most satisfactory. The details of the results obtained by other methods are not included in this communication. For the estimation of tin in the alloy the most convenient procedure was found to consist in the reduction of the solution with coarse antimony powder prior to titration with standard iodine solution. It was found that good results were obtained if 40-60-mesh antimony powder was employed for the reduction process, and that much coarser or finer material lead to erratic results.

The various procedures outlined above were applied to the analysis of four alloys of known composition prepared in these laboratories, by fusion of the pure metals in the right proportions in a vacuum furnace. The results obtained are given below:

Alloy No.	Lead %	Antimony %	Tin %
1	89.2 (89.0)	8.68 (8.75)	2.28 (2.25)
2	80.5 (80.5)	14.63 (14.75)	4.83 (4.75)
3	70.4 (70.5)	19.15 (19.25)	10.30 (10.25)
4	57.1 (57.22)	25.0 (25.17)	17.84 (17.61)

The figure given in brackets in the above table indicate the true percentages as calculated from the quantities employed for preparation of the alloys. It is clear from the above table that satisfactory results were obtained with alloys of a fairly wide range in composition.

My best thanks are due to Dr. K. R. Krishnaswami for suggesting the problem and advice during the course of this investigation.

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¹ Tananæff, *Z. anal. Chem.*, 1935, 100, 394.

Estimation of Gold in Cyanide Solutions

SEVERAL methods are available for the routine control-assays of the gold content of cyanide solutions, but none of them are suited to rapid work.

The following procedure developed in this laboratory is simple and rapid.

A quantity of the cyanide solution containing 50–100 mg. of gold is diluted to 50–100 c.c. and 2–3 g. of thin zinc turnings added. Then 20 c.c. of H_2SO_4 (1:1) is slowly added in 5 c.c. portions at intervals of 5 minutes. After the reaction slows down 10 c.c. of H_2SO_4 (1:1) is again added and the solution boiled for half an hour to complete the precipitation of gold. The precipitate is washed thoroughly with water by decantation and then digested with 10 c.c. (1:2) HNO_3 on the water-bath. The residual gold is well washed, dried, annealed and weighed in the usual manner.

A set of representative results obtained by this method is given in the following table:—

Au taken mg.	Au found mg.	Error per cent.
130.12	120.20	+0.06
130.12	120.06	-0.4
78.00	78.04	+0.05
72.88	73.93	+0.07
50.12	50.69	-0.06

Sets of parallel determinations were carried out by the Chiddy Method observing all the

precautions and the results obtained were in good agreement.

The method outlined above is simple and rapid, and sufficiently accurate for most purposes.

In conclusion, I wish to express my grateful thanks to Dr. K. R. Krishnaswami, D.Sc., F.I.C., for his keen interest and constant encouragement during the course of this work and for much helpful criticism.

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Chromosome Numbers in Safflower (*Carthamus tinctorius* Linn.)

CHROMOSOME numbers in this species have been reported to be $2n = 20$ in Coimbatore types (Gregory)¹ and $2n = 24$ in Pusa type 24 (Patel and Narayana)² and Pusa types 1 and 27 (Gregory).³

In the present investigation Somatic Chromosomes on the metaphase plates were examined from the root tips of the following material.

- (1) Cawnpore type 39.
- (2) Cawnpore type 59.
- (3) Local Selection (Central Provinces) No. 1.
- (4) Local Selection (Central Provinces) No. 7.
- (5) Local Selection (Central Provinces) No. 52.

Twenty-four chromosomes were observed without any exception. Variability within the individual chromosome sets with respect to the size, shape and attachment-constriction of the chromosomes is well marked (Figs. 1 and 2).

Meiotic chromosomes were examined from the permanent smear preparations. The material used in these preparations was the local mixture. Twelve bivalents were distinctly observed at 1 metaphase (Fig. 3).