

been prevailing in the East Coast region since the last metamorphic cycle known as Indian Ocean Cycle.

In comparison with our previous studies on the annealing behaviour of muscovite⁷ and biotite⁸, it has been observed that the correction for loss of tracks by annealing to the fission track ages of phlogopites is slightly less than that for muscovite and biotite.

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1. Fleischer, R. L., Price, P. B. and Walker, R. M., *Nuclear Tracks in Solids*, Univ. of California Press, California, 1975.
2. Nagpaul, K. K., Mehta, P. P. and Gupta, M. L., *Pure Appl. Geophys.*, 1974, **112**, 131.
3. Virk, H. S. and Singh, Surinder, *Min. J. Japan*, 1977, **8**, 263.
4. — and Koul, S. L., *Ind. J. Pure Appl. Phys.*, 1974, **12**, 850.
5. Kere, S. S., *Curr. Sci.*, 1966, **35**, 509.
6. Nand Lal, Nagpaul, K. K. and Nagpaul, M. K., *Ibid.*, 1975, **44**, 411.
7. Virk, H. S. and Koul, S. L., *Ibid.*, 1975, **44**, 341.
8. — and Singh, Surinder, *Ind. J. Pure Appl. Phys.*, 1976, **14**, 421.

A NEW INDICATOR IN THE SEQUENTIAL COMPLEXOMETRIC ANALYSIS OF COPPER AND NICKEL

A NUMBER of reliable analytical procedures for the determination of Cu(II) and Ni(II) are available. There is however no simple volumetric method available for the determination of these metals when present together.

α -mercaptopropionic acid (MPA) forms a violet complex with Cu(II) in the pH range 2.5 and 8¹. In this paper the application of copper-MPA complex as an indicator in the sequential complexometric estimation of copper and nickel in Cu-Ni alloys is described.

Experimental

Reagent: MPA of analytical grade was used to prepare 1% solution in double distilled water. Stock solutions of copper and nickel (0.1 M) were prepared and analysed by standard methods².

Procedure

Aliquots of Cu(II) and Ni(II) solutions containing 3 to 20 mg of the metals were taken in a conical flask. The pH was adjusted between 3 and 4 with phthalate or acetate buffer and two drops of the reagent were added when an intense violet colouration was obtained.

The mixture was then titrated against a solution of EDTA of known strength till the colour changed from violet to bluish green. The burette reading was the total reading for Cu(II) and Ni(II).

Again the same aliquots of Cu(II) and Ni(II) solutions were taken in a separate conical flask and the pH of the mixture was adjusted to between 3 and 4 as before. To this was added about two grams of potassium citrate and about two drops of the reagent. The mixture was titrated with the same solution of EDTA till the colour changed from violet to bluish green. The burette reading is for copper only.

Analysis of Copper-Nickel Alloys

In the case of the analysis of copper-nickel alloys known weight of the given alloy was dissolved in nitric acid and the solution prepared in the usual way. The aliquots of the solution can be used for the analysis of copper and nickel as above (Table I).

TABLE I
Analysis of some standard Cu-Ni alloys with MPA as an indicator

Sr. No.	Percentage of metals expected		Percentage of metals found	
	Cu	Ni	Cu	Ni
1.	87.2	11.3	87.0	11.15
2.	85.5	13.5	85.37	13.4
3.	81.0	17.0	81.12	16.85
4.	77.0	21.0	76.82	20.80

It was found that ions like $S_2O_3^{2-}$, NO_2^- , I^- , $Cr_2O_7^{2-}$, MnO_4^- interfere seriously and should be absent, however, ions like Cl^- , Br^- , $B_4O_7^{2-}$ could be tolerated ten times in excess, while ions like SO_3^{2-} and ClO_4^- could be tolerated only five times in excess.

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1. Klotz, I. M., Czerischski, G. H. and Fiess, H. A., *J. Am. Chem. Soc.*, 1958, **80**, 2920.
2. Vogel, A. I., *Quantitative Inorganic Analysis*, Longmans Green and Co. Ltd., London, 3rd Edn., 1975.