

Occurrence of Cobalt in the Kalyadi (Hassan Dist) and Ingaldhal (Chitradurga Dist) Sulphide Deposits of Karnataka

T.C. DEVARAJU ¹ AND T.T. ALAPIETI ²

1. Department of studies in Geology, Karnataka University, Dharwad - 580 003.

2. Department of Geology, Institute of Geoscience and Astronomy, University of Oulu,
Linnanmaa SF-90570, Oulu, Finland

As attempts are presently being made to extract Co from sulphide ores of Kalyadi and Ingaldhal ore mineral characteristics of the deposits are described. The samples were collected during our visits to Kalyadi and Ingaldhal copper mines in 1994.

Kalyadi: One each of the samples collected from 3rd and 4th levels of the mine, which are said to analyse over 400ppm Co in the bulk analysis, were examined under SEM & EPMA. The study has confirmed that Co is present as *Co-Pyrite*. The mineral occurs as euhedral prismatic to nearly squarish crystals (measuring 15 to 100 microns) enclosed mostly in Co-free pyrite Fig. 1 and at times also in chalcopyrite. Chalcopyrite forms rims and fills fractures in pyrite. The gangue minerals of the ore are mainly quartz and K-feldspar. Magnetite

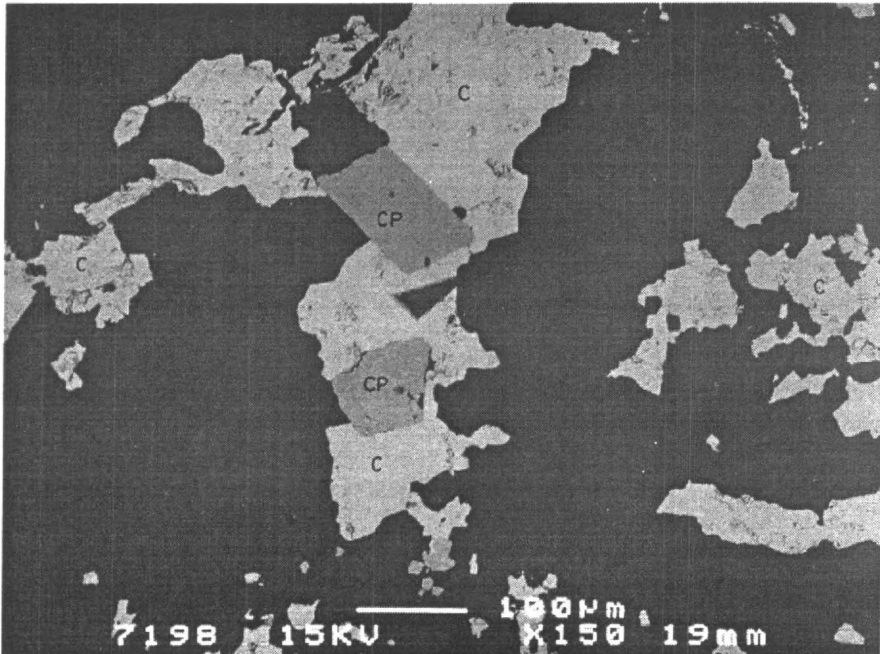


Fig.1. Scanning electron micrograph of Kalyadi sulphide ore showing the occurrence of euhedral crystals of Co-pyrite (CP) enclosed in chlcopyrite (C). Bulk of the associated gangue mineral (dark looking) is quartz.

in euhedral crystals is an important associated mineral. Minute crystals of monazite are of frequent incidence compared to rare zircon and uraninite.

The SEM and EPMA analyses (Table I) have revealed that while Co-pyrite analyses between 5.4 and 8.5 wt% Co, the host pyrite, chalcopyrite and other minerals of the sulphide ore do not contain Cobalt.

Table I. Analyses of *Cobalt-pyrite* from Kalyadi

	1 (12/94)	2 (12B/94)
Co	8.15	6.35
Fe	38.74	40.37
S	53.10	50.75

1. Average of four SEM analyses; 2. Average of four EPMA analyses

Ingaldhal: A set of ten samples were collected from the underground mine levels 3, 10 and 12. Detailed examination of all the samples using SEM has revealed that the most important carrier of Co is *cobaltite* and is present as small inclusions in the main sulphides namely, pyrite, phrrhotite, chalcopyrite and sphalerite. The main gangue minerals in Ingaldhal ore are quartz, chlorite and iron-rich carbonate. Magnetite and tiny crystals of monazite are the other associated minerals.

The other Co-bearing minerals identified in this ore include the rare Co-Ni bearing antimonite (with 16% Co) and the occasional Pb selenosulphide analysing upto 1.3% Co.

The analytical data obtained for *cobaltite* of Ingaldhal (Table II) has indicated that it contains 26.3 to 32 wt % Co (av 29.56%).

Table II. Analyses of *cobaltite* from Ingaldhal (SEM analysis)

	1 (21A/94)	2 (21C/94)	3 (3D/94)	4 (3B/94)
Co	30.30	28.51	28.34	30.79
Fe	4.08	3.88	2.00	2.42
As	44.84	47.42	46.00	46.05
S	20.46	19.54	20.43	19.54

1,2 and 4: Average of three analyses each; 3: Average of two analyses.

We believe that the mineralogical details of Co in Kalyadi and Ingaldhal sulphide ores given here will be of value in developing a suitable process technology for successful extraction of Co from the ores.

Acknowledgments: The SEM and EPMA study was done at the Department of Electron Optics, University of Oulu, Finland. We thank Miss. Ulla. E. Komppa for her help with the analysis and Seppo Sivonen, Director of the Department, for permission to use analytical facilities of the Department.

(Received : 2 December, 1996; Revised form accepted : 3 March, 1997)