SHORT COMMUNICATIONS

A NOTE ON THE FIRST REPORT OF PLATINUM INCIDENCE FROM AURIFEROUS QUARTZ VEINS OF SAKOLI FOLD BELT, MAHARASHTRA

A. K.SAHA[1], K.C. MAHAPATRA[1], S. SHOME[2] and K.G. BHOSKAR[1]
Geological Survey of India
[1]Project: Economic Geology, Operation: Maharashtra, Nagpur - 440006
[2]Central Palaeontological Laboratory, Kolkata - 700016

The Sakoli fold belt (SFB) encompasses an area of about 3600 sq. km in the eastern districts of Maharashtra viz. Nagpur, Bhandara and Gadchiroli. These supracrustal rocks of Palaeo-to Mesoproterozoic age are bound in the north, east and south by the basement granitic gneisses of the Amgaon Group. The contact between the gneisses and the Sakoli supracrustals is highly tectonised. Sakoli Group comprises a highly deformed and metamorphosed volcano-sedimentary sequence where mafic and felsic volcanics are recorded in the lower and upper parts respectively of the stratigraphic sequence. The metasediments are dominantly pelitic in character. These rocks have undergone polyphase deformation and regional metamorphism in middle amphibolite facies. A phase of granitic intrusion into the Sakoli supracrustals has been identified. Stratiform zinc mineralisation and vein type Cu-Au-W mineralisation are known from the fold belt. Platinum incidences from the quartz vein hosted Cu-Au-W mineralisation are being reported for the first time.

In the SFB, major hydrothermal mineralisation is related to (1) submarine volcanic exhalation / sea bed precipitation type, generating sphalerite-scheelite mineralisation in Kolari- Bhaonri area (Bhoskar, 1990; Gadhadharan and Jog, 1990), (2) greisen / pneumatolytic vein related wolframite-scheelite with minor sulphide mineralisation in Agargaon-Khobna-Kuhi area (Mohan and Bhoskar,1990; Seetharam, 1990) and (3) quartz vein- related Cu-Au-W mineralisation in Pular- Parsori- Tuthanbori (Krishnamurthy et al. 1973; Saha and Mohan, 1995) Garara-Nerla-Adyal (Gadhadharan et al. 1997) and Bhimsain Killa- Kitari area (Mahapatra and Sekar, 1998). The mineralized veins trend along ENE - WSW, NW-SE to WNW - ESE and N - S in different prospect areas. All these deposits have typical wall rock alteration patterns viz; greisenisation, chloritisation, sericitisation, silicification, tourmalinisation and arseno-pyritisation. Arsenopyritisation is a commonly observed phenomenon in most of the prospects. Arsenopyrite, mostly as discrete euhedral crystals, has developed along a narrow envelope in the country rock bordering the mineralised quartz veins, which in general are rich in Cu-Zn-Fe-As-Bi sulphides, native bismuth and gold. The Cu-Zn-As-Bi content in the mineralised veins range between 0.5% to 4.17%, 0.3% to 8.20%, 0.1% to 3.7% and 80 ppm to 1200 ppm respectively over an average width of 1.60 m. Development of arsenopyrite could be explained as being due to the introduction of sulphur and arsenic from hydrothermal solutions and their combination with iron released from breakdown of the country rock. Examples of arsenopyritisation are best seen in Bhimsain Killa Pahar and Parsori -Kitari prospects.

Quartz veins (varying in length from a few metres to about 400 m and in width from a few cm to up to 7 m) containing various types of ore minerals are observed in the entire fold belt. The ore minerals include scheelite, molybdenite, chalcopyrite, pyrite, aresenoyrite, pyrrhotite, sphalerite, argentiferous galena, tetradymite, bismuthinite, wittichenite, cassiterite, wolframite, native bismuth, native gold etc. During SEM-EDX examination of the polished sections at GSI, Calcutta, the presence of native platinum (up to 15 microns in size as measured in SEM images) containing Pt: 83.24% - 93.67%, Fe: 2.93% - 9.1%, Ir: 6.02% - 7.4%, Cu: up to 1.65%, with traces of Mn and Ni (as observed from EDX analysis) was confirmed from two gold prospects viz. Bhimsain Killa Pahar and Kitari North Blocks , situated about 30 km apart in Bhandara and Nagpur districts respectively (Fig.1), but having similar geological and mineralisation characteristics. In both these prospects, mineralised veins are hosted in meta-acid tuffs. Native platinum grains occur as fine dispersions either in the quartz matrix or as inclusions in arsenopyrite (Fig.2). These

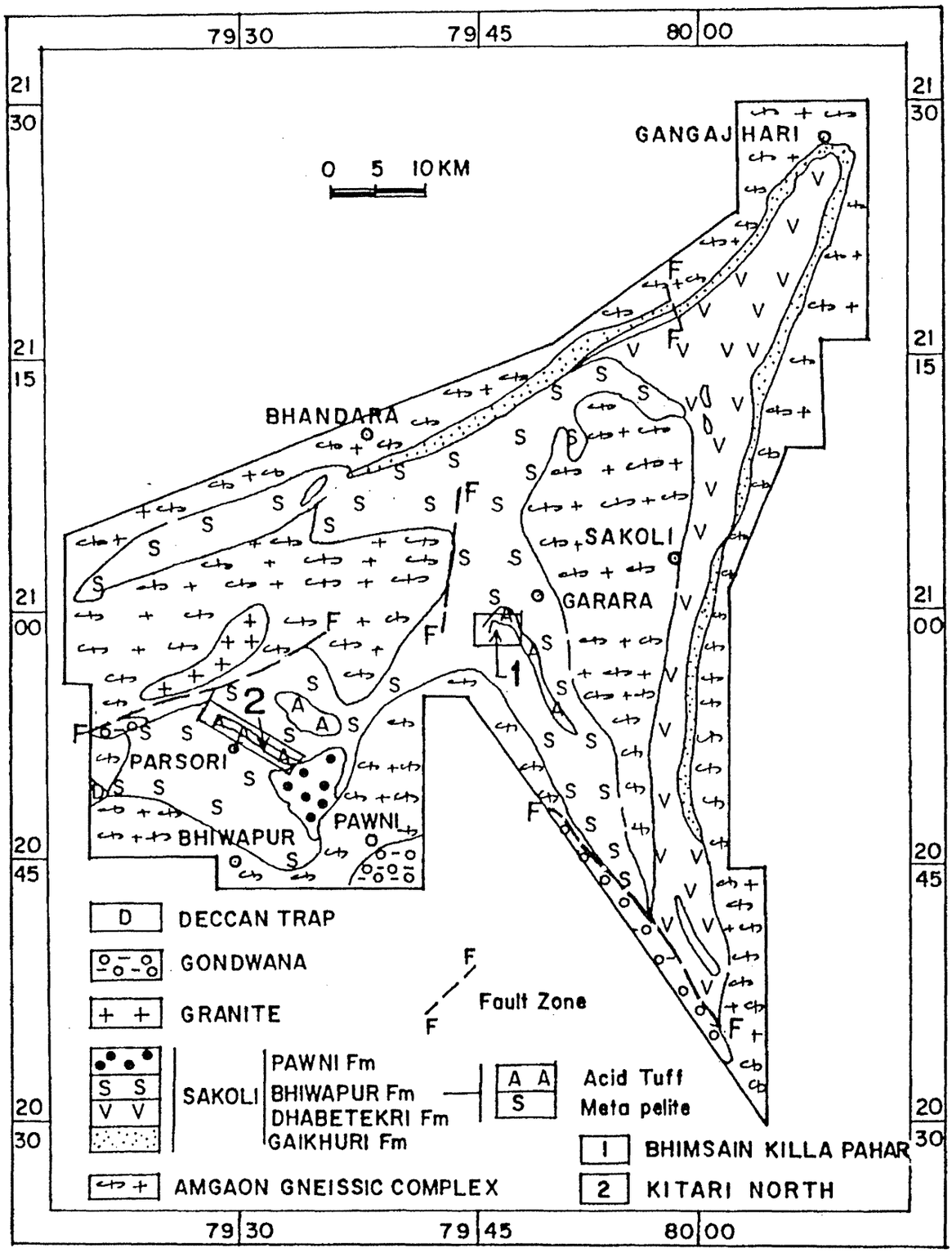

Fig.1. Geologial map of Sakoli Fold Belt, Maharashtra (modified after Roy et al. 1995).

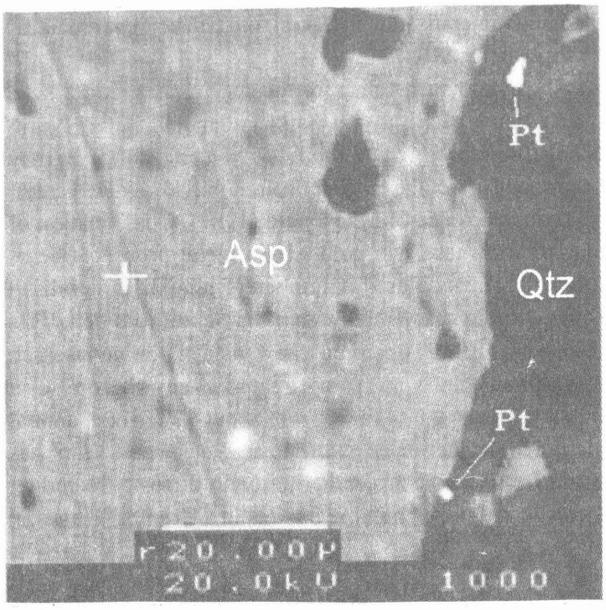

Fig.2. EPMA image showing fine dispersion of native platinum in quartz matrix in close association with arsenopyrite.

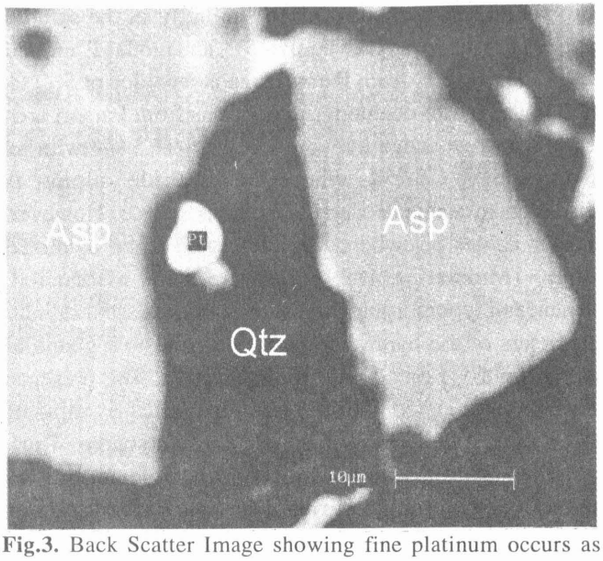

Fig.3. Back Scatter Image showing fine platinum occurs as interstitial grains within pyrite - arsenopyrite-quartz matrix.

grains sometimes occur bordering an altered zone marginal to larger arsenopyrite crystals or occur as fracture fillings within them [as in the Bhimsain Killa Pahar sample] or as fine interstitial grains within pyrite-arsenopyrite-quartz matrix (Fig.3) [as in Kitari North Block sample]. All the grains identified have sub-rounded to elongated shapes and have embayed margins (Fig.4).

Based on the presence of many typomorphic minerals and the trace element character of the ore veins (Chattopadhyay and Saha, 1998); fluid inclusion data (Saha and Chattopadhyay, 1999) and sulphur isotopic data, Cu-Au-W mineralisation is attributed to plutonogenic (granitoid related) origin (Smirnov, 1983). Fluid inclusions in W-Mo and Cu-Au-W mineralised quartz veins from

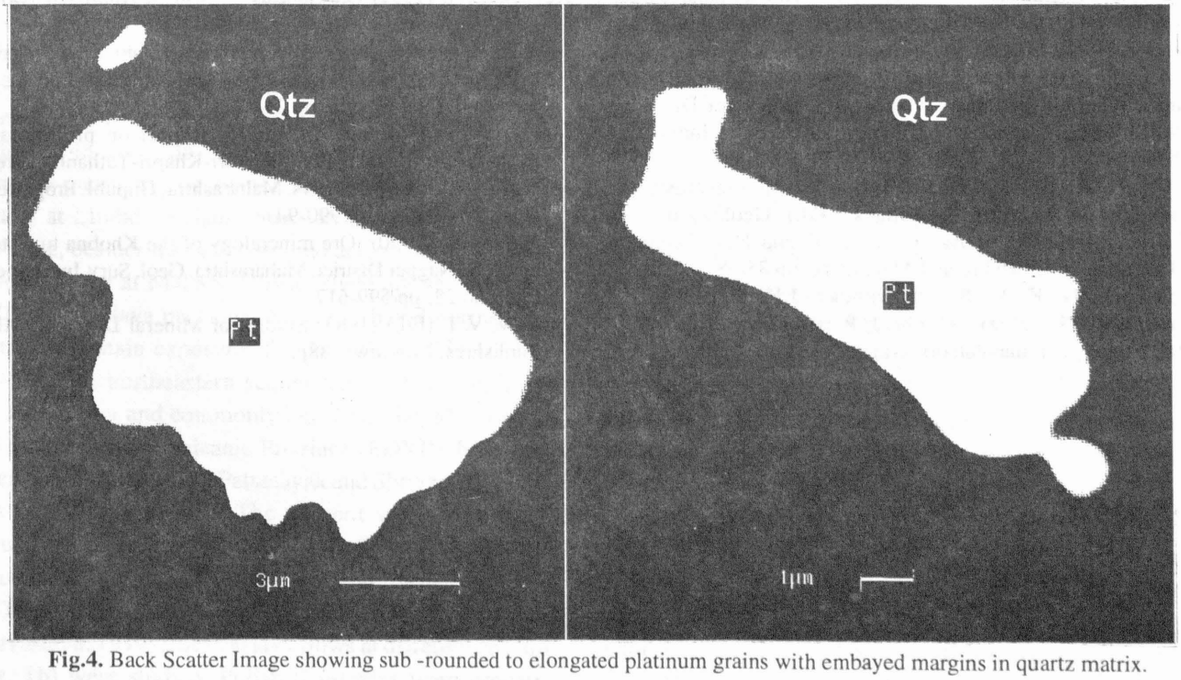

Fig.4. Back Scatter Image showing sub -rounded to elongated platinum grains with embayed margins in quartz matrix.

Khobna and Parsori show close similarity in the salinity range (11 to 42 wt% NaCl equivalent) and modal T_h around 210°C. Highest T_h from Parsori area is recorded at 535°C. $\delta^{34}S$ in the pyrite-chalcopyrite fractions from Parsori area show a narrow range between +0.35 to +6.54‰ with an average of +2.66‰ where the sulphide sulphur is attributed to a mantle derived igneous source. However, similar values elsewhere are interpreted to be of mixed origin (Mukherjee, 1999). The rare metal association, presence of typomorphic granitophile minerals and salinity characters of the hydrothermal fluids point to a granitoid source for base metal-gold mineralisation. The presence of platinum coupled with the low average $\delta^{34}S$ value of +2.66‰ are indicative of mantle derived source. Thus, considering both these aspects a possible mixing of mineralising fluids from two distinct sources has been suggested. Final modelling of the basemetal-rare metal-gold-platinum mineralisation in Sakoli fold belt however requires further studies.

The Au-Pt mineralisation hosted by sulphidic chert/ quartz veins of Bhimsain Killa Pahar and Kitari North Blocks, emplaced within the felsic volcanics of SFB, may be grouped under the epigenetic, remobilised hydrothermal related occurrence of Macdonald (1987). Confirmation of platinum in these two gold - base metal prospects bears great significance as the number of similar mineralised zones is quite substantial within the Sakoli fold belt. This discovery thereby opens up a new vista of platinum search in a milieu that is so far not recorded anywhere else in India. It is relevant to record that about 27% of the annual platinum production in Australia during recent years has come from similar hydrothermal vein deposits including those hosted in Proterozoic meta-acid volcanics (Hoatson, 1990).

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