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NOTES

NATIVE PLATINUM, CHROMITE AND Fe-Ni SULPHIDE IN SITTAMPUNDI ANORTHOSITE COMPLEX

The curvilinear 'U' shaped Sittampundi anorthosite complex within Peninsular Gneisses with a lateral extent of ~ 52 km and maximum thickness of 2 km has a bottom upward igneous stratigraphy comprising gabbro with pyroxenite inclusions, chromitite-layered hornblende anorthosite and clinozoisite anorthosite The present study, involving fifty chromite bearing samples collected between Karungalpatti and Suryapatti villages (12°62'58", 82°62'58"E), illustrates native platinum and PGE bearing phases from the complex The polished thin sections were studied in a Joel 5800 EM, Scanning Electron Microscope (SEM) with Rontec energy dispersive detector (EDS) and the minor elements present in the sulphides were determined by Electron Micro Probe (EPMA) Cameca SX-100 (the analytical details are available with the authors)

The study shows the presence of minerals like rutile, chromite with PGEs, and sulphides Rutile are acicular, rounded-sub rounded and grain sizes vary from (10-50 μm) They are also present as inclusions and isolated grains within the chromite The chromite grains are crystalline and non-crystalline in forms, with the presence of rutile inclusion The non-crystalline forms of chromite are euhedral-subhedral (~ 25 μm) with feeble grain boundaries Silicate inclusions present in chromite are up to (~20 μm) The sulphides present are chalcopyrite, pyrite, pyrrhotite, and pentlandite (Table 1) They range in sizes from (>3 to 20 μm) There is a compostional variation in crystallised and non-crystallised chromite grains Fe-Ni sulphide composition varies from pyrrhotite, through intermediate sulphides to pentlandite Stoichometric (FeS) troilite is also present Most of the sulphides are pyrrhotite Overall, the sulphides are very small (>2 μm) and morphology show rounded, "blobby" to euhedral grains The presence of millerite (NiS), laurite (RuS_2), Iso-ferro platinum (Pt_3Fe) and Omeite (Os As_2), (Figs 1 and 2) were clearly distinguished in SEM studies Because of extremely smaller grain sizes i e 0 5-1μm, the SEM technique excitation area is large, resulting in spurious elements from adjacent grains also in the quantification

It is interpreted that a combination of geochemical processes have played a significant role in forming these minerals under changing temperature and pressure (T-P) conditions The composition of a laurite grain would depend on several factors like the concentration of Ru, Os and Ir in the silicate melt, or the temperature and activity of sulfur prevailing at the time of laurite

Table 1.

Sl No	Si	Al	Ag	V	Cr	Fe	Ni	Cu	Ru	Rh	Ir	Pt	S	Total	Comment	Average
1	0 24	0 13	0 02	0 01	0 35	0 58	97 68	0	0 12	0 13	0 22	0 42	0	99 99	Nickel grain	N=5
2	0 11	4 18	0 02	0 07	21 3	16 61	0	0	0 16	0 34	0 74	56 37	0	99 88	Iso ferro platinum	N=8
3	0 04	0	0 09	0 26	0	0	0	0	57 22	2 67	20	0	19	99 28	Laurite	N=10
4	0 03	0	0	0	2 03	12 3	0 08	61 54	0	0	0	0	23 62	99 57	Chalcopyrite	N=4
5	0 17	0	0	0	7 13	57 77	0 19	0 09	0	0	0	0	34 47	99 82	Pyrite	N=14
6	7 27	0	0	0 11	0 35	28 16	29 85	0 39	0	0	0	0	33 56	99 69	Pentlandite	N=4

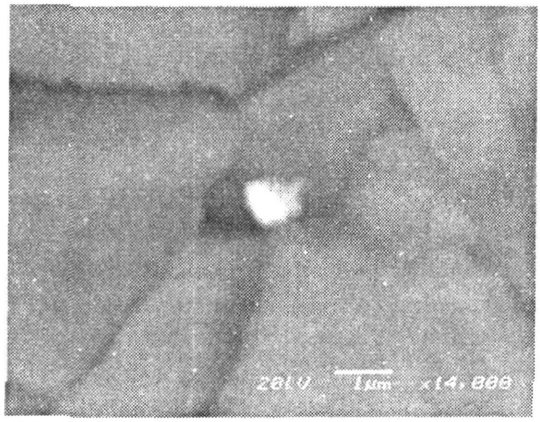

Fig.1a. SEM image of Platinum in chromite grain.

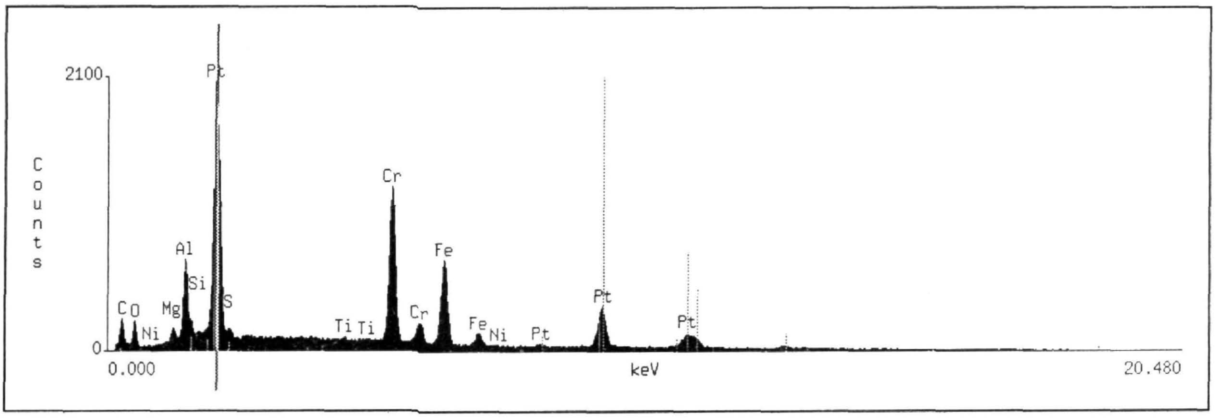

Fig 1b. EDS Pattern for Platinum (Pt, Fe, S).

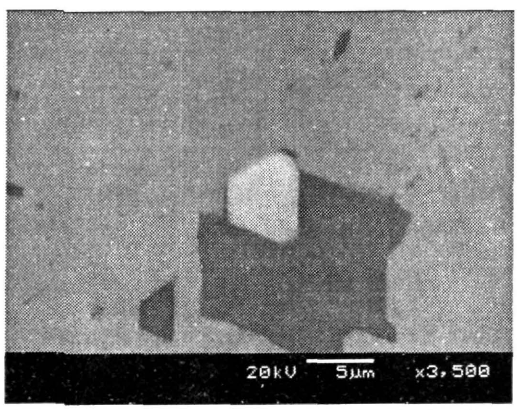

Fig.2a. *Laurite grain in chromite (Ru, Ir, Os) S_2.*

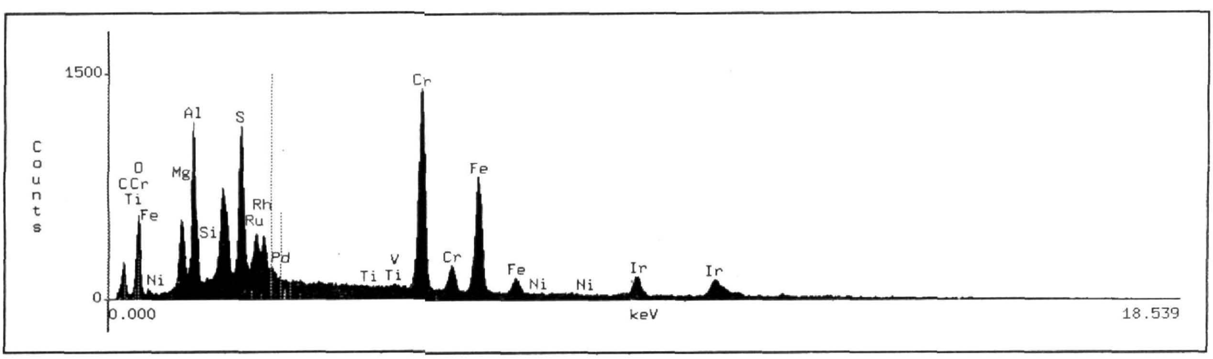

Fig.2b. EDS pattern for Laurite grain in chromite.

crystallization from the silicate melt If laurite comes in to contact with immiscible sulphide melt, then it would be present in sulphide melt or if it is formed before silicate melt reached the sulfur saturation, it will be then enclosed in chromite (Merkle, 1992, Canadian Jour Earth Sci , v 29, pp 209-221) The presence of Fe rich Pt may only form as discrete grains before the sulphur saturation has reached Because of smaller grain sizes, the excitation area also results in spurious elements from adjacent grains To draw authentic conclusions, we require large data base and fresh core samples

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WHIRLING (BUCKLING) AND FRACTURING INDIAN PLATE AND IT'S CONSEQUENCES – A REMOTE SENSING APPRAISAL

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Extended Abstract

Introduction

Consequent to the continental drifting, the Indian plate has moved towards north northeasterly and collided with Eurasian plate, thus resulting into the rise of Mighty Himalayan Mountains along the junction of these two plate boundaries as demonstrated by many earlier Geoscientists But the behaviour of the Indian plate, both during the collision and after that, has not been comprehensively studied and understood as to whether it has remained as an inert plate or suffered any mid plate deformations However, disseminated information has been brought out by many earlier workers on the post trappean arches, deeps, horsts and garbens within the Indian plate Some of such tectonic grains from north to south in the Indian Peninsular are

1 ENE-WSW Luni-Sukri cymatogenic arch in Western India
2 ENE-WSW Amerli arch in northern Saurashtra Peninsula
3 Alternate ENE-WSW horsts and grabens in southern Saurashtra
4 E-W horsts and grabens in Narmada-Tapi region
5 Mangalore (Mulki) – Chennai arch, Palghat deep, etc besides moderate to high mid plate seismicities in different parts of Peninsular India

Under this scenario, detailed interpretations were carried using digitally processed high resolution IRS satellite data and other GIS visualizations of structural, geophysical, geomorphological and hydrological datasets in Mangalore-Cape Comorin-Chennai triangle of the southern part of the Indian plate which lead to the deduction of significant information on the post collision tectonics and the related environmental issues of South India

Deformation of the Southern Part of the Indian Plate

The study has revealed two major E-W trending cymatogenic arches, one along Mangalore-Chennai in the north and the other along Cochin-Ramanathapuram in the south with in between complementary deep along Ponnani-Palghat-Manamelkudi (Fig 1)

The arch regions vividly display conspicuous and unique geological / geomorphological / hydrological anomalies such as

- ENE-WSW Fracture swarms prolifically filled with dolerite dykes along the northern Mangalore–Chennai

Gist of the lecture delivered on 25 July 2007 at the Geological Society of India, Bangalore