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Gold mineralisation in BIF at Channapura area of Yediyur – Karighatta Schist Belt, Mandya District

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Abstract: Channapura area is located on a part of southern extension of Chitradurga schist belt known as Yediyur-Karighatta belt. Banded iron formation (BIF) is defined as a finely bedded or laminated sedimentary rock with anomalously high iron content and sometimes, but not always, interbedded with chert; even when they are metamorphosed, the relict banding is usually still evident. The study area consists of predominantly volcano sedimentary sequence represented by amphibolites, quartzite, and garnet ferrous quartz-mica schist. Based upon the field work data and the detailed investigation consisting of close spaced sampling followed by drilling in Channapura area in Yediyur - Karighatta schist belt which could prove another size able gold deposit in BIF rock formation.

Keywords: BIF, Gold, Schist, Quartz.

I. INTRODUCTION

Channapura area is located on a part of southern extension of Chitradurga schist belt known as Yediyur-Karighatta belt. The Yediyur-Karighatta belt is the N-S trending narrow schist belt sandwiched between gneiss on both sides and is composed of predominantly a volcano sedimentary sequence represented by amphibolites, quartzite, garnetiferous quartz-mica schist/phyllite intruded by metagabbro dykes and younger quartz veins. The belt represents a large synformal keel (FD2) with complimentary antiform present in the gneisses on both sides.

The schist belt underlain by gneisses consists of quartzite band in the east within thin veneer of amphibolites. Schistose amphibolites is the dominant unit with ultramafites, quartzites and BIF bands occurring in it. The amphibolites is overlain by metapelite unit represented by quartz-chlorite schist occurring mainly in the core of synform. The BIF band occurs at the contact between amphibolites and quartz-chlorite schist has become repetitive due to folding.

II. DESCRIPTION OF ROCK TYPES IN CHANNAPURA AREA

The different rocks types occur in the area are given as follows.

Granite Gneisses: are the dominant rocks types occur surround the schist belt rocks. The gneisses are migmatitic gneisses composed of alternate bands of biotite rich and quartzofeldspathic bands with varying degrees of migmatitisation, partial melting of gneisses is evident from the presence of bands of leucsome, melanosome or restites and mesosome. The mineral constituents recorded are quartz, plagioclase, K-feldspar and biotite.

Amphibolite: is the predominant unit well exposed on both sides of the investigated area. It is fine grained to medium grained, well schistose, bluish to greenish grey in colour and comprises of actinolite, chlorite, and plagioclase. Schistosity i s defined by the parallel alignment of actinolite and chlorite grains. The mineral composition suggests that their derivation from basis volcanic rocks by metamorphism.

Ultramafites: ultramafic rocks occur as small lensoid enclaves and thin layers in association with amphibolites.

Quartzite: it occurs as a prominent marker horizon occurring in the margins of the schist belt. It is fine to medium grained, hard, compact, greenish to yellowish grey in colour and well bedded. Foliation is represented by subparallel alignment of mica flakes.

Quartz-mica-phyllite schist: The politic schists/phyllites are represented by quartz- mica schist occupying the core of synformed keel. It is soil covered due to easy-weathering and fissile nature. It is medium grained, dull grey in colour, weathered and altered. It composed of quartz, muscovite, biotite and minor chlorite shows dull greenish grey appearance and phyllitic luster.

Banded Ferruginous Quartzite: Banded ferruginous quartzite occurs as bands at the contact of amphibolites and quartz-mica schist and defines the major synformal folds. The repetition of bands is due to folding and very shallow to sub horizontal plunging nature of the large folds resulted in the occurrence of more than one subparallel band as limbs of folds. There are six bands occur in the area. It is hard, steel to whitish grey in colour, compact shows rhythmic layering of ferruginous and siliceous matter vary in thickness from a few mm to 2 cm at a stretch. It is oxidized and limonitised at places looks reddish brown in colour. The width of the BFQ bands varies from 2 to 20 m. The bedding attitude in BFQ trends in N-S with steep dips of 75-85° towards east and

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sometimes west. Then BFQ shows mesoscopic F2 folds showing dextral shift having plunge of 25 30° towards N10°E direction. Pitted surface occurs at places due to leaching of sulphide minerals.

Quartz veins: Thin, white colour quartz veins have been emplaced along axial planes of F2 folds. The quartz veins vary in thickness from a few mm to 2 cm in general and even upto a maximum of 20 cm at places contains sulphide minerals mostly pyrite minerals. Pitted surface is developed at places due to leaching of sulphide on weathered surface leaving brownish stain. The quartz veins are aligned in NNE-SSW along the minor fold axial planes extends for limited strike length.

III. STRUCTURE

Bedding is the non-diastrophic structure exhibited by BFQ rock by the colour and compositional banding. The bedding trends in N-S with steep dip (75°-85°) towards east and sometimes west. The area has been subjected to three phases of fold deformations as in the case of Chitradurga schist belt. The F1 folds are well preserved in BFQ north of Kalinganahalli village. F1 folds are very tight, rootless, isoclinal folds S1 schistosity is developed in quartz-mica schist. S1 strikes N-S direction with steep easterly, westerly and subvertical dip. The F2 phase deformation is represented by superposing of meso and macro folds and F1 and S1. The F2 folds are tight to open, upright folds shallow to non-plunging in N-S to NNE-SSW direction striking and subvertical axial planes. S2 crenulation cleavage is developed on amphibolites and quartz-chlorite-mica schist. F3 folds are represented by broad warps trending in E-W direction.

Gold mineralisation:

The ancient gold mining activity in this area has been evidenced by the presence of small pits measuring 2 m x 2 m x l m depth and mining dumps containing quartz material spread over a radius of 1 to 1.5 m. The gold mineralisation is associated with white colour quartz veins emplaced along axial plane fractures of F2 folds in the banded ferruginous quartzite rock. The quartz veins vary in thickness from a few cm to a maximum of 2 m. The quartz veins contain sulphide minerals, pyrites on fresh surface and cubic marked pitted surface on weathered surface due to leaching of sulphides leaving brownish stain

Petrography studies

Extensive field and micro-textural observation reveal that the study area comprises of different litho-units, which include peninsular gneissic complex, Phyllite, BIF, Quartz veins etc. There litho-units exhibits various micro-texture of different mineral assemblages.

1. Phyllite: Due to continuous leaching of matrix pyrite oxidized. Phyllite mica schist occupies the core of synford keen. Phyllite consist altered phyrite in box work, its show dull greenish grey appearance. The pyllite preliminarily was consist of Pyrite in the matrix during the metamorphism of sediments. However due to continous of oxidation and hydration the pyrite are altered and leached out leaving behind box work structure mainly of Iron oxide.

$$FeS2+H2O+O2 \rightarrow Fe2O3 + H2SO4$$

Pyrite — Leaching — Box work

2. Quartz vein: - Quartz vein occur thin variable form and cutting across the BIF.They are pale brown colored due to Iron content in them.

3. BIF – It occurs in two forms, as oxide and sulphide facies. They show alternate band of Iron Minerals like Magnetite, Hematite, pyrite and Quartz. The BIF are hard and compact and metamorphosed. The grains of Iron Mineral and grain boundaries of Quartz are well developed in the hand specimen.

Magnetite: - They are hard, Compact, Magnetic opaque occur between quartz bands.

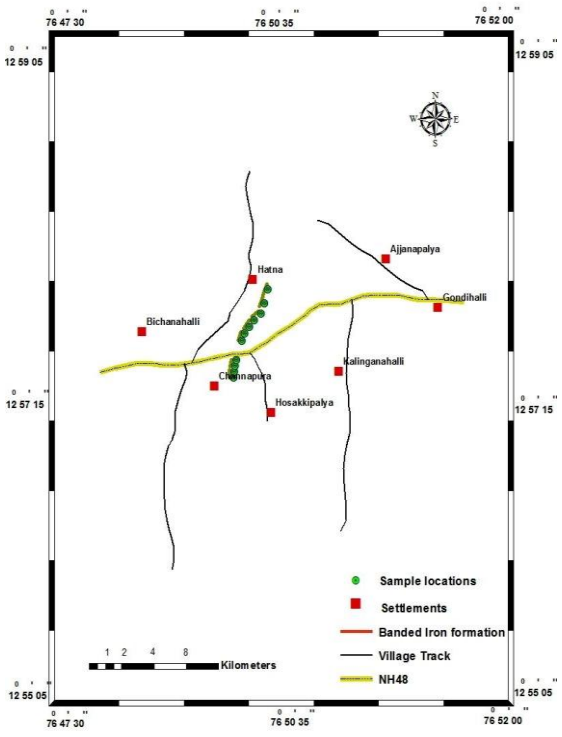
Hematite: - They are hard, Compact, Nonmagnetic, Cherry red in colour. Generally they are formed from the alteration of Magnetite minerals.

Quartz: - They occur between Iron Minerals in the form of bands. They are pale brown in colour due to presence of Iron oxide in them. They are Coarser to finer grain in hand specimen.

Limonite: - They are yellow in colour, fine grained, formed from the alteration of Hematite and Magnetite during oxidation and weathering process.

Goethite: - They are dark black in colour, occur as globular and colloforms form.The are tha altered mineral of Hematite and Magnetic. During the alteration concentric bands of Iron minerals are formed.

Geological map of the study area



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Composition of major elements:

The elements like Fe2O3, Al2O3 and FeO are analysed by volumetric method. CaO and MgO are analysed by complexotitrimetric method. Silica is analysed by gravimetric method. TiO2 and MnO are analysed by calorimetric methods.

Parameters	Composition of major elements	
	Sample No. 1	Sample No. 2
SiO2	47.14	49.78
Al2O3	03.19	02.63
FeO	03.72	04.19
Fe2O3	38.48	36.59
CaO	00.98	00.56
MgO	00.42	00.39
Na2O	00.84	00.79
K2O	00.42	00.34

Field Photographs

Weathered and fractured phyllites in Channapura area

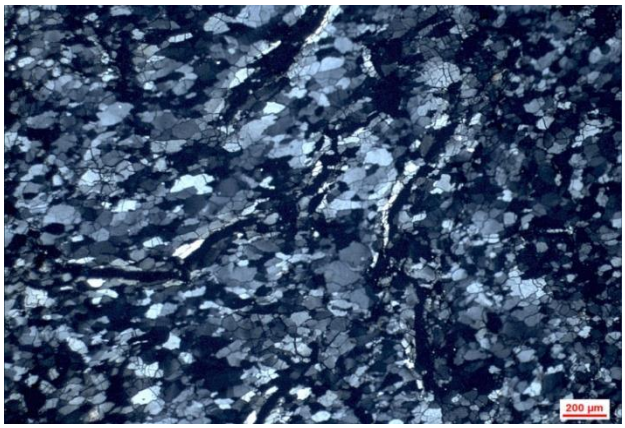
Iron formation altered to limonite (yellow colour) in the out crops

Indicator plant for gold occurence

Petrography Studies of Thin Section

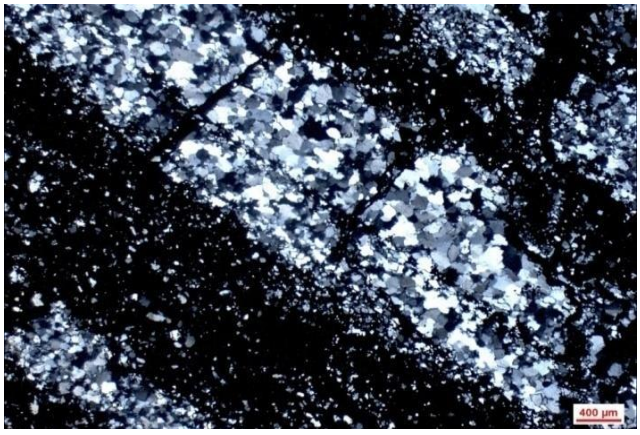
Section No-1

Granoblastic texture: - Quartz occurs as porphyroblast with interlocking partial triple point between the grain can be noticed, show undulose extinction, colour grey to greyish in thin section



Section No-2

Thin section show banded texture (alternate Iron and quartz grains).The quartz exhibit granular texture with interlocked grains, fibrous growth of Iron minerals along the fracture can be noticed in the band of quartz.



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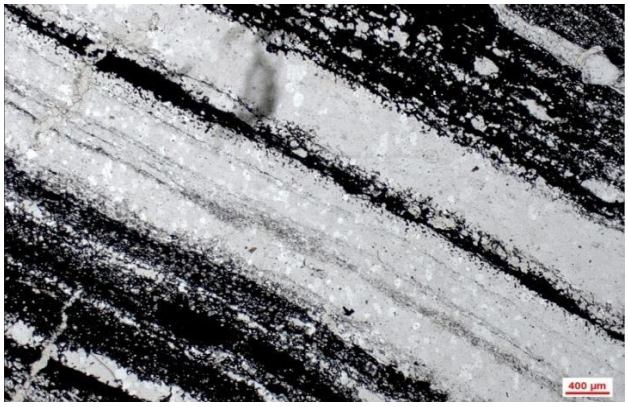
Section No-3

Alternative BIF bands

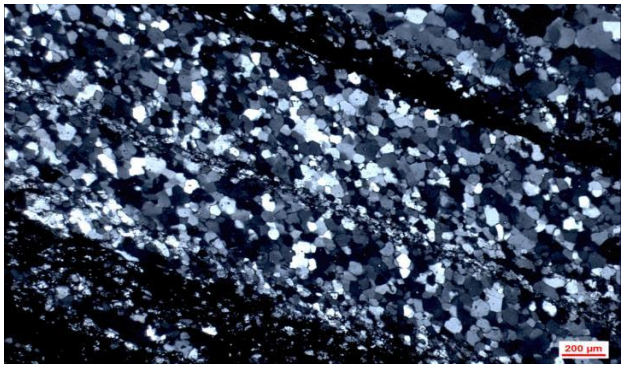
Section No-4

A well-developed Banded texture of Iron minerals and quarz grain are exihbited by the section.In broad quartz band the iron minerals occur as thin lamination in linear fashion.



Section No-5

Quartzite: - The quartz occur as granoblastic texture or Polygonal texture with well-developed grain boundaries, Partial triple point between the grains can be seen they exhibit undulose extinction.



Section No-6

Quartzite: - The quartz occur as granoblastic texture or Polygonal texture with well-developed grain boundaries,Partial triple point between the grain can be seen. They exhibit undulose extinction

IV. CONCLUSION

Yediyur-Karighata schist belt is a prominent, linear, narrow schist belt. The study area consists of predominatly volcanosedimentary sequence represented by amphibolite, quartzite, and garnetoferrous quartz-mica schist.

The BIF Of the area mainly consist of Magnetite, Heamatite and quartz with inclusion of traces pyrite. They show the S2 Deformation in the form of folding and microfolding can be evident from the thin section. The magnetite show alteration to martite and hematite and also altered to goethite.

From the analysis of GSI, it is found that all the BIF bands occurring in the Channapura area is auriferous with assay values from 25 ppb to 1.30 ppm. The grade of the mineralized zones varies from 0.025 g/t to 1.3 g/t over width vary from 2.50 to 11.50 m. The mineralization is richer in the westernmost BIF band and easternmost BIF bands with lean zones occur in the central BIF bands.

As the surface samples collected with strike interval of 250-300 m had analyzed gold values as mentioned above, it is a potential area for gold mineralization.

So it is recommended to take up this area for detailed investigation consisting of close spaced sampling followed by drilling which could prove another size able gold deposit in BIF rock.

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