ABSTRACT

The study area falls within the southeastern (around Mosaboni-Badia) and central (around Rakha-Tamapahar-Jaduguda) sectors of the 140 km long arcuate thrust belt, known as the Singhbhum Shear zone, Bihar State, located on the northeastern part of the Indian Precambrian Shield.

The different rock types encountered in the study area are feldspathic rock, chlorite-quartz schist, biotite-quartz schist, massive quartzite, quartz schist, quartz-kyanite schist, Dhanjori volcanics and muscovite schist (occasionally garnetiferous). The general strike trend of the rocks in the shear zone is from NWW to SSE and they dip at moderate angles towards north-east. The formation of various planer and linear structures of the rocks are coeval with the tectonic evolution of the area. Feldspathic rock and chlorite-quartz schist are the chief host rocks of the sulphide ores in the two sectors. The sulphide ores usually occur along the closely spaced $S_2$ and $S_3$ planes of the above host rocks.

The sulphide ores are of three types, viz., i) massive, ii) braided, and iii) disseminated. The following ore minerals have been identified in the sulphide ores:
Major: Chalcopyrite, pyrite and pyrrhotite.

Minor: Sphalerite, magnetite (ilmenite), chalcocite, covellite, bornite, molybdenite, millerite, galena, tellurbismuth and tetradyntite.

Exsolved: Cubanite, valeriite, marcasite, pentlandite and violarite.

The paragenetic sequence of the primary and secondary ore minerals has been determined.

The replacement, annealing and deformation textures indicate that the ores were subjected to dynamothermal and dynamic metamorphism while the exsolution texture is referable to retrogressive metamorphism. The nature of primary and some exsolved ore minerals indicate that the temperature of the formation of the ores ranged from 200°C to 450°C.

Most of the oxide constituents of the host rocks show orderly variation in their concentrations with respect to the location of the sulphide lodes. For example, in feldspathic rock, FeO, MgO, Na₂O and also K₂O increase and TiO₂ decreases towards the lodes. In chlorite-quartz schist, total iron, TiO₂, MgO, CaO and marginally Na₂O, MnO and P₂O₅ increase towards the lode.

Since the average concentrations of FeO, MgO, CaO, Na₂O and K₂O in Dhanjori volcanics, biotite schist and chlorite-biotite schist are more or less similar, a closer geochemical relation among the three rock types is envisaged.
The host rocks have suffered alteration due to chloritization, biotitization, sericitization and to some extent silicification, though the alteration zones are not so orderly developed as usually found in hydrothermally altered rocks.

Study of trace elements like Cu, Pb, Zn, Co, Ni, Rb and Sr in feldspathic rock, chlorite-quartz schist, biotite schist, chlorite-biotite schist and biotite-quartz schist indicates that the abundances and variation ranges of the elements are different in different rocks.

Traces of Cu and Zn in the feldspathic rock increase towards the lode. Similarly, Ni in chlorite-quartz schist increases towards the lode. Generally, the host rocks have higher concentrations of Cu, Co and Ni than in some well-known acidic, granitic, metasedimentary or pelitic rocks.

Generally, the concentrations of Cu and Sr are lower and those of Zn, Co and Ni, higher in Dhanjori volcanics than in the average basaltic rocks.

Abundances of Cu, Fe, Ni, Co, Zn, Pb, Rb, Sr, Mn and Ti in about 27 ore samples collected from both the sectors are quantitatively determined. Generally Cu, Fe, Ni, Co and Zn in the ores of Mosaboni are higher than in those of Tamapahar.

The distribution trends of Co, Ni, Mn and Ti in the separated mineral fractions of the ores, viz., chalcopyrite, pyrite and pyrrhotite have also been studied and certain
observations have been made with regard to Co, Ni, Mn, and Ti in chalcopryrite, pyrite and pyrrhotite of Mosaboni and Tamapahar. The Co:Ni ratios in chalcopryrites of Mosaboni and Tamapahar are lower than those recorded in chalcopryrites associated with hydrothermal ore deposits. On the other hand, Co:Ni ratios in pyrrhotites, associated with the ores of the two sectors, are higher than those found in pyrrhotites of hydrothermal origin. Also, the ratios of the two elements in pyrites of the study area are appreciably higher than those of hydrothermal or sedimentary pyrite deposits. However, the range of average Co:Ni ratios in pyrites indicates that the latter originated as a result of mobilization.