A B S T R A C T

The copper(+molybdenum) mineralization at Malanjkhand in a polyphase granitic terrane of Proterozoic age is confined within a sheared quartz reef enveloped by pink-feldspar bearing granitoid which also contains feeble mineralization in form of 'stringers', disseminations and 'pegmatoidal' ores. Non-porphyritic coarse-grained nature of the granitoids, confinement of the orebody within a single reef, lack of any zonality in the metal distribution and alterations and origin of both the 'main' orebody and the lean ores from fluids of same temperature, salinity and density point to a significant deviation from the classic 'porphyry-type'.

The primary ore mineral assemblages, strikingly similar in the main orebody and the lean ores, comprise pyrite(I), chalcopyrite, magnetite(I) as major phases and magnetite(II), pyrite(II), hematite, sphalerite, molybdenite and chalcocite as minor phases. An early barren stage followed successively by an oxide and a sulfide stage are discernible from the paragenesis.

Fluid inclusions in quartz, cogenetic with sulfides in the 'main ore' and 'lean ores' show near identical T_H maxima, though their spreads are variable. Thermobarometric information derived from intersection of isochores in pure-aqueous and pure-carbonic inclusions and pressure estimation from temperature of total homogenization of aqueous-carbonic inclusions provide a temperature range of 148-329°C and a pressure range of 600-1700 bars for the entire spectrum of precipitation of secondary silicates and sulfides. The data agrees reasonably well with that derived from chlorite composition. T_H - salinity and T_H - density data indicate mixing of a high-T, low density tenuous fluid with a larger volume of low-T moderate density fluid as the immediate cause of mineralization the bulk of which occurred in a narrow temperature range(near 200°). Subsequent unmixing of carbonic component from the fluid is indicated. Results of mineral-fluid equilibria points to a rise in f_{H_2S} first , followed by lowering of temperature and elegantly explains some ambiguities in textural interpretation of the paragenesis.

Three phses of granitoids, all peraluminous and corundum normative are recognized on the basis of their field relation and petrography and

also by their distinctive petrochemical signatures and Rb-Sr age. The youngest phase derived from more acidic crustal source, appears unrelated to and by inference younger than the mineralization. The other two groups are temporally closer(may even represent a continuum) originated from a basic parentage through a single episode of melting and are genetically related to mineralization. An influx of meteoric water into an upwelling crystal-melt mush heralded the onset of hydrothermal stage and accounts for the belated appearance of K-feldspar and quartz.

The deposit thus constitute an example of low-temperature hydrothermal mineralization evolving through an 'early influx' of meteoric water; pervasive alteration of ferromagnesians attendant-enrichment of the fluid in ore-metals; its migration to shear zones, fractures etc.; precipitation of quartz and microcline; mixing with a tenuous fluid and precipitation of sulfides.

KEY WORDS

Fracture zone, reef, stringer, pegmatoidal, dissemination, paragenesis, oxide-stage, sulfide-stage, isochore-intersection, fluid mixing, CO_2-unmixing, chlorite-solution model, f_{H_2S}, complexing, granitoids, leucogranite, pervasive-alteration, microclinization, silicification, amphibolite-enclave, REE-distribution, Rb-Sr systematics, equilibrium crystallization, meteoric-water influx