Paper Number: 3986

Gold mineralization along the Gurharpahar ridge in the Mahakoshal fold belt, Central India: Mode of occurrence, distribution, structural controls and exploration.

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Gold mineralization in the 3.4 km long WNW-ESE trending Gurharpahar ridge of the Mahakoshal Fold belt in Central India has been studied in terms of mode of occurrence, distribution, secondary mineral association, grade variation, structural controls and exploration through trenches and drill holes. The Late Archaean to Palaeoproterozoic Mahakoshal belt represents a volcano-sedimentary sequence that are exposed near and parallel to the ENE-WSW to E-W trending Son-Narmada geofracture with an aerial extent of 9000 sq km. The lithological makeup of the belt is stratigraphically classified into an older Agori Formation (comprised of limestone, BIF, greywacke, with lenses of tuffs and metabasic rocks) that is overlain by the younger Parsoi Formation (comprised of mostly phyllites with bands of metagrewacke and quartzites). The Mahaoshal belt is subjected to multistage deformation and bears metamorphism of greenschist facies.

Gurharpahar is situated within the Parsoi Formation and bears Gold mineralization. Lithologically the area is composed of the variegated, tuffaceous and/or carbonaceous phyllites with lenses of cherty quartzites. The area bears signatures of multistage deformation up to at least three stages. D1 deformation produced tight-to-isoclinal recumbent to gently inclined overturned folds (F1) with axial planar cleavage S1 in the primary layering (bedding) of the Parsoi Formation. The D2 deformation is marked by refolding of the F1 folds to form plane non-cylindrical, tight, upright-to-steeply inclined folds with axial planar cleavages (S2) that dips steeply due SSW. The plunge of the intersection lineation between bedding and cleavage of F2 folds varies in amount and diametrically opposite in azimuth along ESE-WNW. The S2 foliations are ubiquitous in the phyllites and develop pervasively throughout the area. The F1 and F2 are nearly parallel. The D3 deformation is a cross-folding of the F2 structures to develop minor kinks and broad gentle-to-open upright folds (F3) with axial surfaces that strike NNE-SSW. Spaced fractures develop parallel to the axial traces of F3.

Gold mineralization is structurally controlled and occurs in three distinct modes in the area viz. (1) within arsenopyrite rich layers parallel to S2 foliation of the phyllites (2) within syn-F2 quartz-carbonate-sulphide veins and quartz veins that are laminated, stretched and boudinaged and (3) within post F2 quartz-carbonate sulphide veins occupying the closely spaced fractures that are at an acute angle to the regional schistocity (S2). Gold occurs as macro-to-microscopic disseminated grains in the form of elongated, irregular, round to oval blebs with occasional pseudo-rhombohedral outline of arsenopyrite. Gold grains occurring within quartz veins show a gold-silver ratio of 8:2 when analyzed by EPMA. Major

associated sulfide minerals within the quartz–carbonate–sulphide veins include arsenopyrite, pyrite, pyrrhotite, marcassite, galena, sphalerite and chalcopyrite.

Exploration through trenching and drilling have delineated five mineralized zones, Zone-I to Zone-V from west to east that are disposed in en-echelon pattern with strike lengths of 341m, 523.50m, 735.75m, 1087.50m and 323m respectively. From analysis of trench samples and drill cores, the concentration of gold is found to vary between 12.5g/tonne to 0.5gm/tonne in the mineralized zones with depth continuity to at least 160m.