Structural control of gold mineralization in Lubok Mandi area, Peninsular Malaysia

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Lubok Mandi Gold Mine is an active gold mine located in the Eastern Belt of Peninsular Malaysia. The area is dominantly covered by volcano-clastic and metasedimentary rocks (slate, phyllite). In some places the rocks are carbonaceous. This rock formation is Middle Carboniferous to Permian in age and is cut by dacitic dyke as well as quartz veins. The major structural trends in the Lubok Mandi area are controlled by WNW-ESE (thrusting fault zones), NNW-SSE (shear or lateral fault zones) and NE-SW (right lateral fault zones). The earlier ductile deformations formed folds, microfolds and cleavages, followed by quartz veins. Brittle deformations formed shear and fault zones which controlled the formation of the mineralization. The mineralization in the quartz veins and the wall rocks is related to intensive alteration such as silicification, argillitization and propilitization (chloritization) especially around the sheared and lateral fault zones. The common minerals observed are native gold, chalcopyrite and arsenopyrite with pyrite being the most dominant. The result of the fluid inclusioin analysis from quartz vein gave a temperature of 196.2°C–198.7°C and salinity 3.7%–4.2%WT. The structures which control gold mineralization in the area was studied using all the available slip data of the meso-structures observed on the fault planes. The stress history or paleostresses of the area, which was operating at the time or after the formation of the fault planes, determined the movement or slip, that took place on the fault planes. At the same time it also governed the orientation of the gold-quartz veins which are related to the gold mineralization of the area.

Generally, the mineralized quartz veins are related to and followed the NNW-SSE dextral fault zones but at times they followed the WNW-ESE thrust fault zones. Based on the fault slip data of the meso-structures, three directions of the paleostress were obtained. The first paleostress was related to the brittle-ductile deformation, acting in the NE-SW ($\sigma 1$ = 08°–09°, N197°–211°E) controlled the folds, cleavages, thrust fault zones and quartz veins. The second direction, NNE-SSW ($\sigma 1$ = 04°-25°, N194°–220°E) was related to purely brittle deformation that controlled the dextral fault zones and mineralised quartz vein zones. Finally, the compression with $\sigma 1$ = 18°–19°, N232°–255°E was responsible in the right lateral slip fault zones with NE-SW direction.

The NNW-SSE quartz veins that followed the dextral fault zones are the centre of high-grade gold mineralization, especially those in the quartz breccia.