QUARTZ FABRICS AND FLUID INCLUSIONS VOLATILES AT FAZENDA BRASILEIRO GOLD MINE: A PRELIMINARY PETROGRAPHICAL AND RAMAN MICROPROBE STUDY

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Fazenda Brasileiro Gold Mine is located in the northeastern part of Bahia State, Brazil, within a 8 km E-W shear zone (Weber Belt), in the mafic domain of the "Rio Itapicuru" Greenstone Belt. It is an Early Proterozoic auriferous quartz-lode deposit hosted in iron-rich sheared chloritic schists (Santos et al., 1988).

Shear deformation during greenschist facies metamorphism (F1) produced a thick mylonite zone generating a high permeability path. Gold deposition occured along this ductile shear zone, mainly during a F2 ductile-brittle deformation stage (Reinhardt and Davison, 1988). Raman spectroscopy analyses of about 50 fluid inclusions were made in five mineralized quartz-vein samples according to the structural evolution of the Fazenda Brasileiro Gold Mine. Samples FB-1, FB-2 and FB-6 were collected from thin concordant (with S1) veins which were boudinaged by flattening perpendicular to S1 and subsequently folded by F2 et F3. They are interpreted to be early to syn F2 age. Sample FB-5 corresponds to a discordant vein, not strongly deformed, with incipient boudinage and folding. Sample FB-4 represents irregular lenticular "masses" (centimetric to metric thickness), discordant (with S1) and localized in F2 fold hinge zones. The last two samples are interpreted to be late F2 age (Reinhardt and Davison, 1988). These samples are composed of a quartz - albite - sulfide - gold assemblage.

According to quartz fabrics the fluid inclusions may be broadly divided in two groups : (a) those situated in residual phenoclast of quartz imersed in a recrystallized matrix (FB-4 and FB-5 samples show well developped phenoclasts with corroded borders, while FB-1 and FB-2 samples present small ones, almost all recristallized) ; and (b) those related to the own recrystallized quartz grains (localized within and in the boundaries of the neograins and in nucleation centers inside phenoclasts), which are observed in all samples.

The "early" stage inclusions can be subdivided in four types : type I CO_2-CH_4-N_2 usually C-bearing, type II CO_2-CH_4 frequently C-bearing, type III CO_2 and type IV CH_4-N_2-(H_2O). Water was not observed when type I fluid inclusions are associated with graphite ; it may have been lost after trapping either by diffusion (Roedder, 1984) or by in situ reactions (Dubessy, 1984) ; alternatively, water contents may have been larger than estimated from microscopic observations (Kreulen, 1987).

Later inclusions, related to recrystallized quartz, apparently do not contain graphite and have higher water proportions : in addition to the compositon range in earlier inclusions (types I, II and IV) one notices the presence of Type V CH_4-(H_2O) inclusions and the lack of Type III CO_2 ones. Types IV and V are sometimes in secondary trails cross-cutting recrystallized quartz. Later H_2O rich inclusions are present in all samples mainly along healed fractures. In fluid inclusion studies carried out on three mineralized samples at Fazenda Brasileiro Mine by Xavier (1987), distinction between inclusions belonging to phenoclasts and recrystallized quartz was not observed neither C-bearing iclusions.

Two main episodes of the hydrothermal evolution may be illustrated :

(1) Early CO_2-CH_4-N_2 and CO_2-CH_4 usually C-bearing fluid inclusions in phenoclasts may indicate an earlier circulation of a hot low-density fluid probably equilibrated with graphitic pelites during metamorphism, reflecting fluid compositions during the brittle-deformation of quartz (F2);

(2) The inclusions observed in the recrystallized quartz could result from the mixing of the former volatiles with aqueous fluids.

Type I inclusions from recrystallized quartz appear spatially related to auriferous sulfides and free gold ; hence they probably represent the ore forming fluids. Fluids trapped in phenoclasts are not considered to have played a role in the genesis of the mineralization and are thought to be metamorphic volatiles older than gold deposition.

The model proposed for the ore genesis is related to the destabilization of soluble gold complexes in relatively oxidized fluids that would rise along the ductile shear zone, when it became reduced by interaction with graphitic pelites that rest structurally above the mineralized zone. Above 400°C (the minimum trapping temperature of type I fluid inclusions recorded by Xavier, 1987) the fluid maintained its fO_2 close or above the Q-F-M buffer, compatible with the graphite-fluid equilibrium (Kreulen, 1987). Gold deposition may have taken place when the graphite-fluid equilibrium was no longer maintained. Fluctuations of temperature around the blocking temperature of the graphite-fluid equilibrium (Ramboz et al., 1985) could have caused repeated stages of gold deposition, possibly during all the period of ductile-brittle deformation (F2).

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ISSN 0999-5870

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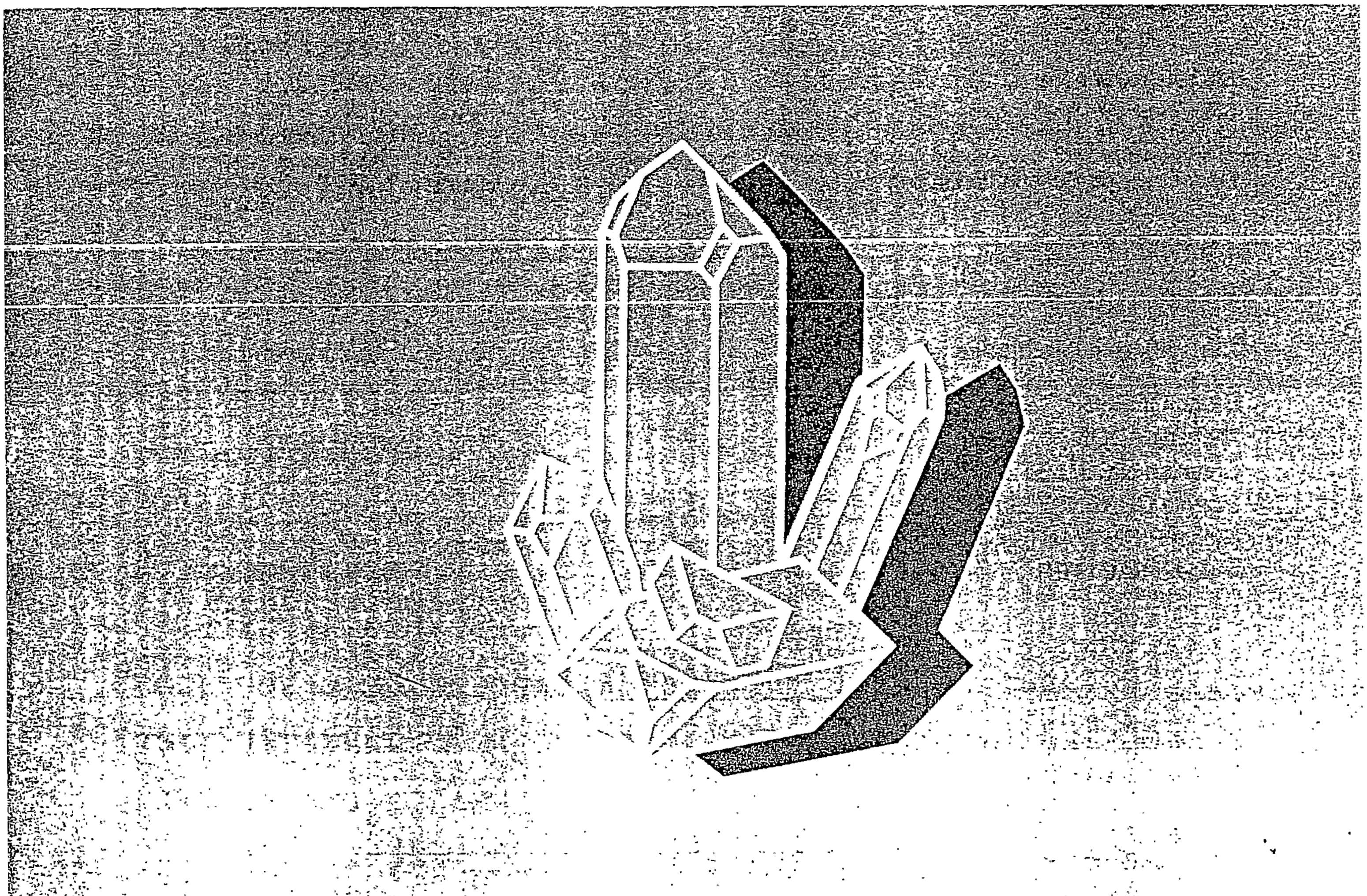

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