DISSOLUTION AND TRANSLOCATION OF RESIDUAL GOLD PARTICLES UNDER EQUATORIAL LATERITIC CONDITIONS

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ABSTRACT

Gold mobility under supergene conditions have been the subject of a great number of studies as summarized by Boyle (1979). However, most of these works have demonstrated this mobility by indirect evidences. Thus, for example, Benedetti (1989) reports that trace gold concentrations with an average of 10^{-10} to 10^{-11} mole / liter have been found around gold deposits in acidic surface waters An other indirect evidence is given by Mann (1984), Freyssinet *et al.* (1987), Lawrance (1988), Colin *et al.* (1989), by reporting the occurence of supergene gold crystals in lateritic wheathering profiles. According to Mann (1984), gold mobility in lateritic profiles in the Yilgarn block of Western Australia can be explained by the occurence of high chloride concentrations in the drainage system Thus according to this author and to the experimental studies of Krauskopf (1951) and Cloke and Kelly (1964), gold is complexed by chloride to form auric chloride complex in very acidic, highly oxidizing, chloride-rich conditions. In surficial lateritic environment, however, the acidic surface waters are stronghly diluted and thus the factors which control gold mobility are poorly understood.

The present study adresses the gold dispersion halo found at Dondo Mobi in the equatorial forest of Gabon (Colin *et al.*, 1989; Edou Minko *et al.*, submitted). This halo develops vertically from the protore to the surface through the saprolite, the nodular layer and the sandy-clayey layer and then describe an aureole which spreads laterally beyond the auriferous body.

This deposit provides an ideal opportunity to study gold mobility under equatorial lateritic forest conditions.

Morphological and chemical studies have been performed on gold particles extracted from the fresh auriferous lisvenite and from the different weathering layers through the profile toward the surface. The results demonstrate that the gold particles are residual and subjected to increasing weathering, upward through the profile to the surface in the central part of the halo, laterally upslope and downslope at the surface, and then downward to the initially barren saprolite in the rim of the halo. Thus, gold content progressively decrease, silver content of gold particles decrease, the gold particles gradually become smaller with rounded shapes and surface pitted by dissolution holes. The dispersion pattern is thus controlled by gold dissolution and translocation of residual gold particles.

These processes involve an autochtonous evolution in the central part of the dispersion halo and a short-distance allochtonous evolution in the rims of the halo .

At Dondo Mobi, the disperslon of gold is especially evident in the upper layers of the weathering mantle, where the pH ranges from 4 to 6 and the oxygene fugacity has a value of $fO_2 = 10^{-0.68}$, which corresponds to a well ventilated horizon with a high porosity according to Nahon (1976). At Dondo Mobi, only chloride and fulvic

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acide are available ligands capable of complexing gold (Colin and Vieillard, submitted). Thermodynamic calculatlons show that the gold solubilty increases with increasing silver contents and that the complex formed are aurous hydroxichloride and organo-metallic complexes. These gold complexes are stable under surficial lateritic conditions and thus gold can be removed from the upper part of the weathering mantle.

Thus, both chemical and translocation processes cogenerate the mobility of gold and gold particles in equatorial lateritic weathering profiles.

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