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VERTICAL ZONATION OF COPPER AND SILVER IN GOLD CRYSTALS AT THE CERRO CASALE GOLD PORPHYRY DEPOSIT, MARICUNGA BELT, NORTHERN CHILE

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INTRODUCTION

The morphological evolution of gold particles contained in stream sediments or soils constitute an effective exploration tool for the determination of the distance to the gold –bearing orebody (see Herail et al., 1999 a, b; this volume). In addition, the composition of the core from the gold grains allows to discriminate between gold porphyries, gold – rich copper porphyries and epithermal mineralization (Palacios et al., 1999a; this volume). Although both methods assist effectively the exploration of gold – bearing deposits, mainly in areas of thick soil and/or dense vegetation, it is not possible to determinate the part of the deposit which is under erosion and thus remnant ore mineralization potential. In order to contribute for the solution of this problem, we present a study about the vertical zonation in the composition of gold crystals in the Cerro Casale gold porphyry deposit. The geology of the orebody is described by Palacios et al. (1999 b).

The Cerro Casale deposit is entirely preserved and exhibit a vertical section of more than 1,000 m, offering an excellent opportunity for this study. We have used microprobe analysis of 116 gold crystals over a vertical section of 700 m. Date on gold crystals of K silicate mineralization stage recovered from fragments of hydrothermal breccias have been not considered.

RESULTS

The diagrams of figures 1 and 2 exhibit the variation of Ag and Cu content in gold crystals with the elevation in the orebody.

Ag abundances in gold deposited during K silicate alteration decrease progressively from 19-21% Ag at the deeper levels in the deposit (3,400 m) to 7-16% in the

upper part of the orebody (3,900 m). In contrast, Ag concentrations in chlorite-sericite gold crystals are invariable between 1.6- 8.5% Ag through the all vertical section of the deposit. Cu concentrations in K silicate gold crystals do not varies with the elevation, and exhibit abundances between 0.02 to 0.18%. However, Cu contents in chlorite-sericite gold crystals decrease steadly from 0.24-0.33% at an elevation of 3,350 m, to 0.05-0.12% for an elevation of 4,025 m above sea level.

CONCLUSION

The results of this study evidence that Ag abundances in the K silicite and Cu concentrations in chlorite-sericite gold crystals decrease steadly from the bottom to the top of the Cerro Casale gold porphyry. As has been reported by Palacios et al., (1999b) Ag contents in gold crystals allow to discriminate between K silicate (8-28 wt.%Ag) and chlorite-sericite (1-8 wt.% Ag) precious metal grains in this deposit. However the available data do not permit to distinguish K silicate gold grains arising from fragments of hydrothermal breccias. Thus, using Cu microprobe analysis of chlorite-sericite gold crystals, it is possible to define during exploration, the section of the orebody which remain under erosion, having possible to infer the remnant ore mineralization potential in gold porphyries.

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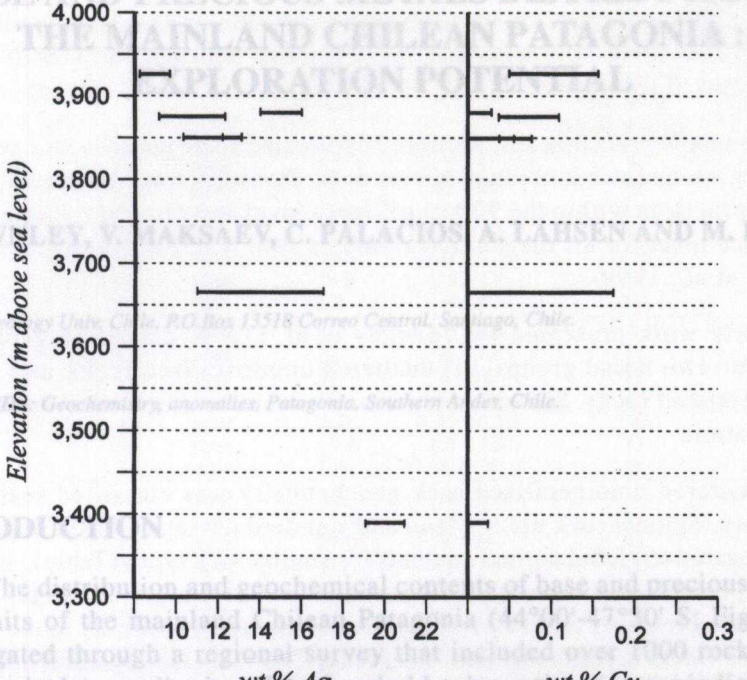

Fig. 1.- Vertical zonation of Ag and Cu in gold crystals deposited during K silicate alteration.

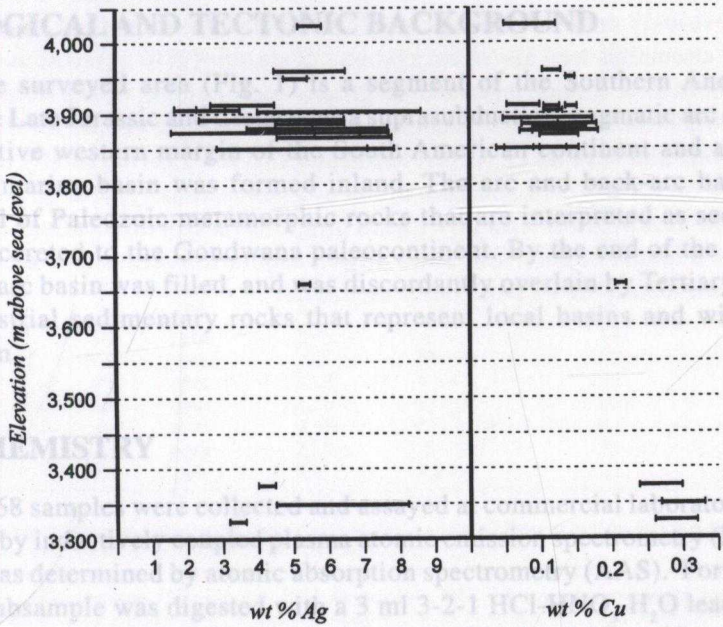

Fig. 2.- Vertical zonation of Ag and Cu in gold crystals deposited during chlorite-sericite alteration.