

Trace element composition of Au alloy in the Lone Star area, Klondike Au District, Yukon

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In the Klondike Au District, Yukon, world-famous for its historical placer production, the study of the major and minor element composition in Au alloy has proven critical for linking placer and lode sources [1], a fundamental tool for mineral exploration. Furthermore, Au alloy composition has been also useful for understanding the mineralizing processes responsible for the Au endowment in the district. However, the studies so far have important limitations, mostly related to the restricted suite of elements fully resolvable by EPMA, and the scarcity of mineral inclusions in Au alloy [2], which restrict their use for geochemical fingerprinting. In this study, we use LA-ICP-MS spot data to reveal the fundamental trace element geochemical signature of placer and lode Au alloy in the Klondike.

Preliminary results indicate that Cu and Sb were detected and quantified in most placer and lode Au alloy grains, while Hg, Pd, Pb, Bi, Te and Pt were detected in more than half of the analyzed grains. Systematic compositional trends were observed for lode Au alloy in terms of geographical distribution. Median Cu concentrations in lode Au alloy are the highest in Lone Star (~200 ppm) and decrease systematically towards the southwest, reaching ~30 ppm in Dysle and Violet. Referential concentration data in lode Au alloy suggest that Hg shows the opposite trend, reaching the highest abundances in Violet and systematically decreasing to the northeast. Median Sb concentrations in lode Au alloy are higher in the Au occurrences between Lone Star and Violet, reaching maximum median concentrations of ~20–30 ppm. These data confirm and expand the compositional trends observed in past studies [1].

Future work related to this project is complementing the Au alloy trace element data with the interpretation of Pb isotope signatures in Au alloy, allowing the assessment of the most likely metal sources for the Au in the district, as well as permitting contrasting the mineralization in the Klondike with Au deposits elsewhere.

References:

[1] Chapman, Mortensen, Crawford & Lebarge (2010), *Economic Geology* 105, 1369–1392.

[2] Chapman, Mortensen, Allan, Walshaw, Bond & MacWilliam (2022), *Economic Geology* 117, 361–381.