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Nucleus deposit: a superposed (?) Au-Bi-As-Cu mineralized system at Mountain Freegold, Yukon, Canada, with constraints from molybdenite Re/Os and titanite U/Pb geochronology

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The Nucleus deposit, in the central Dawson Range, west central of Yukon, is within the Dawson Range Cu-Au-(Mo) Belt portion of the Tintina Au Province that spans from Alaska in USA to Yukon in Canada and hosts significant Intrusion-Related Gold (IRG) deposits (1, 2). The Nucleus deposit has an indicated resource of 1.31 M ounces of gold, within 74.7 Mt at 0.55 g/t Au with a cut-off grade of 0.3 g/t (3) and it is characterized by two distinct styles of mineralization including: (i) reduced Au-Bi skarn and; (ii) quartz-sulfide-Au-Bi ± Cu vein-controlled mineralization style. Vein-controlled mineralization occurs as mainly veins and veinlets of various shapes (sheeted, single, stockworks, and crustiform), breccias, and disseminated, whereas skarn occurs primarily as massive thick lenses (up to 35 m apparent thickness) that are rarely banded and locally vuggy and as accessory sulfide replacement bodies.

In order to constrain the temporal and by inference the genetic relationship between the two types of mineralization from Nucleus, the ages of the vein-controlled and the skarn mineralization styles were assessed by molybdenite Re/Os dating and hydrothermal titanite U/Pb (both LA-ICPMS and CA ID-TIMS) geochronology, respectively. The petrogenetic age from the vein-controlled mineralization was constrained at 75.9±0.3 to 76.2±0.3 Ma (4). Titanite ID-TIMS U-Pb data resulted in overlapping concordant points, giving a weighted mean ²⁰⁶Pb/²³⁸Pb age of 182.6 ± 2.4 Ma. Titanite LA ICP-MS U-Pb data yielded a best estimate age of 190 ± 1.5 Ma

These results clearly indicate the Nucleus deposit is composed of two non cogenetic mineralizing events. The Nucleus deposits is therefore better interpreted as superposed mineralized system in which later formed Cretaceous quartz-sulfide-Au-Bi ± Cu veins, of relatively shallow crustal level, overprinted the earlier formed and deeper reduced Jurassic Au-Bi skarn during multiple protracted mineralization events.

References:

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- [3] NFR, March 25, 2015 news release
- [4] Bineli Betsi T et al. (2013) Miner Deposita 48: 991-1017

