

Mineralogy and geochemistry of the Northern Dancer W-Mo deposit, Yukon and British Columbia

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The Northern Dancer (Logtung) deposit is a W-Mo intrusion-hosted porphyry system located on the Yukon-BC border within the central belt of the Yukon-Tanana Terrane. Northern Dancer is one of the world's largest W resources, with an inferred resource estimate of 242 Mt at 0.10% WO₃ and 0.047% MoS₂ assuming a cut off grade of 0.05% WO₃ [1]. Classification of Logtung is problematic due to its characteristics of porphyry, skarn and vein deposits. Mineralization [2, 3] is developed within Cretaceous monzonitic granite, crosscutting felsic dikes, and adjacent hornfelsed country rocks which were thermally metamorphosed by early Jurassic diorite plutons located southwest and northeast of the deposit. Four spatially overlapping vein types host the majority of mineralization [3]. The earliest mineralized veins (Type 1) are quartz-garnet-diopside dominant with accessory molybdenoscheelite and fluorite. Crosscutting the Type 1 veins are quartz-feldspar-pyrite veins (Type 2) with accessory scheelite, fluorite, and prominent inner epidote-chlorite and outer hornblende alteration halos. Quartz-epidote-clinozoisite veins (Type 3) are generally restricted to the felsic dikes and host the majority of molybdenite mineralization. Polymetallic quartz-beryl-scheelite-molybdenite veins (Type 4) which crosscut all earlier veins but not all felsite phases can be up to 1 m wide, and continue outside the deposit zone. Type 4 veins contain the coarsest scheelite, with grains averaging 3 mm but as large as 15 mm. Electron microprobe compositions of scheelite show deposit-wide average concentrations of 1.90 wt % MoO₃ (max. 22.49 wt % MoO₃). Type 1 veins average 4.85 wt % MoO₃ (max. 22.49 wt % MoO₃), Type 2 veins average 1.36 wt % MoO₃ (max. 7.03 wt % MoO₃), and Type 3 veins average 0.77 wt % MoO₃ (max. 4.95 wt % MoO₃). Type 4 veins average 0.97 wt % MoO₃ (max. 11.83 wt % MoO₃), and contain a maximum Nb₂O₅ concentration of 0.50 wt %. Whole-rock geochemical and Rietveld analyses completed on intrusive and host rock lithologies provide a framework for interpretation of vein mineral chemistry.

- [1] Ghazanfari, F. (2007) Snowden Inc., for Largo Resources Ltd. [2] Stewart, J.P. (1983) M.Sc. thesis, Univ. of Toronto [3] Noble *et al.* (1984) *Econ. Geol.* **79**, 848-868.

Investigating marine organic matter diagenesis using STXM and Carbon K-edge XANES

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Organic matter in the oceans forms one of the largest repositories of reduced carbon on Earth, and one of the least well understood compositionally. Up to 80% of marine organic matter consists of material that cannot presently be identified as known molecules or extracted as such. Furthermore, this material is produced by a plethora of very small (sub micron to sub mm) primary producers and altered by similarly scaled consumers and bacteria. We employed the technique of Scanning Transmission X-ray Microscopy coupled with Carbon K-edge X-ray Adsorption Near Edge Spectroscopy to investigate compositional trends from fresh particulates to sediment samples several 1000's of years old. Marine particulates begin with a high degree of nanoscale chemical heterogeneity, and this heterogeneity is maintained throughout water column diagenesis. All compound classes (e.g. proteins, carbohydrates, lipids) are represented in this material. Additionally, more recalcitrant material, such as soot, graphite, and plastics, are found in water column particulates but are less common. Only when particles reach the sediments do they become more structurally and chemically homogenous. As organic matter ages and decays, there is a progressive loss of alcohol and free acid groups and a gain in the proportion of aliphatic and aromatic carbon moieties. This change is most noticeable in deep-ocean suspended particulates and in sediments, implying that major oxygen group losses take place in organic matter only after months to years of diagenesis have gone by. The presence or absence of dissolved oxygen does not appear to strongly influence these patterns. Thus chemical and nanoscale structural diagenesis appear decoupled from bulk flux diagenesis patterns, which are strongly influenced by the presence or absence of dissolved O₂.