The role of Organics in Au Systems: Relationships between Black Carbon and Mineralisation

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Ubiquitous organic matter (OM) present in several Au deposits supports a general view, that OM plays a passive or active role in mineralization. Appearance, nature and origin of indigenous OM within Au deposits may provide vital information about transport and accumulation processes in which the OM played a role. In addition, elevated Au concentrations in framboidal pyrite in distal black shales associated with major Au deposits suggest regional syn-sedimentary to early diagenetic Au enrichment prior to ore body formation [1]. Biomarker and compound specific isotope analyses of low maturity black shales provide crucial information about redox and other environmental conditions during sedimentation and early diagenesis.

In a first case study, indigenous OM in the thermally mature orogenic Cosmo Howley Au deposit (NT, Australia) was investigated. Black carbon (BC) was isolated from the indigenous OM fraction by a novel hydropyrolysis approach [2]. The OM contained >93 % BC and showed an increase in both concentration and $\delta^{13}C$ (from -28 to -23 ‰) of the BC fraction towards the ore body. These results are consistent with increased aromatization/graphitization of the OM as the ore body is approached, which is interpreted to increase the sorption potential of the formation and therefore the fixation of dissolved Au. Microstructural properties, e.g. surface area, are currently being investigated by BET N_2 sorption isotherms and scanning electron microscopy (SEM).

[1] Large, Bull and Maslennikov (2011), *Economic Geology* **106**, 331-358 [2] Meredith, Ascough, *Bird et al* (2012), *Geochimica et Cosmochimica Acta* 97, 131-147