

6.6.P04**Heavy metal enrichment in Archean carbon-rich samples: Hint to early carbon-metal compounds for enzyme formation?**

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Bio-essential metals, such as Zn, Cu and Ni, are postulated to activate enzymatic reactions. Formation of carbon-metal compounds was probably important in the pre-biotic world to incorporate bio-essential metals into early metabolic reactions. Ancient geological samples may have hints for the formation of early carbon-metal compounds.

Analyses by X-ray scanning microscope were performed on kerogen-rich and graphitic samples collected from the ~2.7 Ga Abitibi Greenstone Belt and ~3.8 Ga Isua Supracrustal Belt.

Abitibi samples, black shales deposited on komatiite lava flows, interacted with hydrothermal fluids associated with submarine volcanism. Although most kerogen-rich samples did not contain any heavy metals, intensively altered samples contain Cu, most likely forming Cu-kerogen compounds.

Veined graphite (1 to 2 mm in thickness) is recognized in Isua samples (meta-quartzite and siderite iron ore). Such graphite was most likely formed inorganically during metamorphism and siderite was the carbon source. It is found that Zn and possibly Ni are enriched in veined graphite.

These geological samples indicate that bio-essential heavy metals were incorporated into kerogen or graphite by submarine hydrothermal or metamorphic processes. It is hypothesized that such carbon-metal compounds were utilized for the early enzyme formation.