Bimodal carbon isotope compositions of organic matter at ca. 2.7Ga Wawa Greenstone Belt, Schreiber, Canada

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Submarine hydrothermal activities were intensive at 2.7 Ga ocean floors, forming volcanogenic massive sulfide deposits globally. Influence of such global submarine hydrothermal activities on 2.7 Ga ecosystem has not been constrained well. In order to examine the influence of submarine hydrothermal activities on 2.7 Ga, mineralogical and geochemical studies were performed on massive sulfide, chert and shale samples collected from Schreiber area, Ontario, Canada.

Massive sulfides and sulfidic chert were mainly distributed in the eastern part of Schreiber, including Morley Occurrence [1]. Geological occurrence and mineral assemblages suggest those sulfidic rocks were formed by submarine hydrothermal activities. Later contact metamorphism modified mineralogy, but bulk rock chemistry and stable isotope compositions were not changed. Sulfur isotope compositions of massive sulfide range from –0.8 to +9.6‰(CDT), suggesting that source of sulfur for sulfides were seawater sulfate. Massive sulfide and sulfidic chert often contain organic carbon (up to 0.3 wt%), which carbon isotope compositions are ranging from –30.1 to –25.3‰ (PDB). At the middle and western part of Schreiber, non-sulfidic black shale occurs. Those samples contain organic carbon up to 14 wt%. Carbon isotope compositions of organic matter in shale samples are ranging from –40.4 to –39.5‰ (PDB), suggesting that methanotrophs were a part of biota besides other phototrophs in the Schreiber sedimentary environments. More ^{12}C depleted features of organic matter in sulfidic samples were most likely representing thermally degraded features. Such degradation may have caused by submarine hydrothermal activities, releasing large amounts of methane with hydrothermal fluids into 2.7 Ga oceans and then activated methanotrophs.

[1] Philip *et al*. (1989) *Canadian Mineralogist*, 27, 601-616