

## STEM observation of graphite from 3.8 Ga Isua Supracrustal Belt

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Graphite is known to occur in the 3.8 billion years old Isua Supracrustal Belt (ISB) of western Greenland, and <sup>13</sup>C-depleted graphite from sedimentary rocks of the ISB have been interpreted as traces of early life. The unequivocal documentation of biogenicity for graphite is complicated by the possibility of secondary graphite precipitation from metamorphic or igneous fluids and the difficulties in distinguishing biogenic from secondary graphite.

Graphite in meta-sedimentary rocks and carbonate veins in ISB is studied by STEM and Laser-Raman spectroscopy. Previous studies proposed that graphite in meta-sedimentary rocks are biogenic in origin, and others are chemical precipitates from CO<sub>2</sub>-rich fluids. STEM observation of graphite in meta-sedimentary rocks indicated many unique textures, resemble to carbon nano-tube. On the other hand, graphite in veins show sheet-structure-dominated features. Laser-Raman analyses indicate that sedimentary graphite recorded the peak metamorphic temperature. Graphite in veins showed lower temperature than that of the peak metamorphism. Those data comprehensively provide more evidence of biogenic graphite that differ from non-biogenic graphite in ISB.

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