# Significance of abiogenic graphite in the 3.8 Ga Isua Supracrustal Belt: Implications to chemical evolution?

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Previous models for the chemical evolution often require abundant methane, ammonia and phosphate to form amino acids and nucleic acids. However, it has been enigmatic as to where chemical evolution took place. Driving force (energy) for chemical evolution has also been uncertain. Here I propose the possibility that some pre-biotic organic molecules were prepared insides of ancient continents.

Fragments of ancient continents occur at Isua in Greenland. 3.8 Ga supracrustal materials are found in this area including the oldest biogenic graphite. On the other hand, previous investigators described occurrence of abiogenic graphite in Isua Supracrustal Belt.

Detailed geological surveys and thermodynamic calculations in this study suggest that abiogenic graphite in Isua were formed during 3.7 Ga metasomatic processes related to migration of CO2-rich fluids. Stable isotope data suggest abiogenic graphite were coexisting with methane, suggesting significant amounts of methane were migrating insides of oldest continents. It is found that metamorphic minerals are enriched in ammonia, and significant amounts of phosphates were remobilized with metasomatic fluids. Eexperiments at my laboratory indicate the production of pre-biotic organic molecules under high temperature and pressure conditions, when methane and ammonia were available with catalytic minerals. These data further leads to a new hypothesis that the pre-biotic organic molecules could be prepared in the Heddian to Archean crustal environments. This idea also corresponds to implications for the Thomas Gold's Deep Hot Biosphere.