

Discovery of boron-rich metasediments in Isua Supracrustal Belt: Window to RNA genesis?

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Selective stabilization of ribose is required among various sugars, in order to synthesize a basic unit of RNA (i.e., AMP). Recent study demonstrated that borate stabilized ribose selectively, and suggested the importance of borate-rich environments for prebiotic RNA genesis (1). On the other hand, it has been uncertain if borate-rich environments were present on the ancient Earth. Here I report the discovery of boron-rich rocks in the >3.7 billion years old Isua Supracrustal Belt of western Greenland. REE patterns and Al-rich characteristics of examined rocks indicate their marine sediment origin. These rocks belong most likely to the metasediment unit, which contain biogenic graphite (2). Abundant tourmaline crystals (feruvite in chemical composition) were found in the examined rocks. Some tourmaline occur as inclusions in garnet and some are associated with biotite. Such mineralogical occurrence suggests that the precursor of tourmaline was present well before metamorphism. Thus, pre-metamorphic Isua marine sediments were rich in borates and sedimentary clays were responsible to concentrate borates from ocean. This leads to a possibility that prebiotic RNA could be formed in Hadean marine sediments, which had abundant clays, borates, and prebiotic organic matter. This model is consistent with the previously proposed chemical evolution model based on clay-rich marine environments (3).

(1) Furukawa *et al* (2014) OLEB on line; (2) Ohtomo *et al* (2014) *Nature Geoscience* vol.7, 25-28 (3) Joshi *et al* (2009) *JACS*, vol.131,13369-13374