Geochemical characteristics in serpentinized ultramafic rocks from northern China

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The serpentinized ultramafic rocks can provide important information about pre-life and life organic compounds in early history. The abiogenic hydrocarbons and other organic compounds formed through the serpentinization of ultramafic rocks could provide necessary energy and raw materials for supporting chemosynthetic microbial communities, which probably was the most important hydration reaction for the origin and early evolution of life. Serpentinization generally occurs in slow expanding mid-ocean ridges and continental ophiolites tectonic environment, etc.

Gas isotope composition of inclusions in serpentinites from northern China showed both abiogenic and biogenic origins.Organic compounds in serpentinized peridotite could be sourced either from abiogenic mathane generated through the FTT type reaction under condition of reduction and high hydrogen concentration during serpentinization of peridotite, or from biogenic organic compounds originated from thermal degradation of oceanic organic matter and/ or from residual organic matter of microbial activity. The overprint of biological and abiological processes will create a big challenge to identify the biogenic organic materials in serpentinite-hosted ecosystem.

Mössbauer spectra analysis of serpentinized peridotites from northern China revealed chemical species of Fe and the relationship between the rate of serpentinization progress and oxidization-reduction properties. The samples from Inner Mongolia province with the high value of $Fe^{3+}/\sum Fe$ range from 0.62 to 0.79 indicated the weak reductive power and nearly complete serpentinization progress. By contrast, the samples from Gansu province with the low value of $Fe^{3+}/\sum Fe$ range from 0 to 0.23 indicated the strong reductive power and low rate of serpentinization progress. The distribution of Fe^{3+} in serpentinized peridotites could provide important information to evaluate hydrogen production.

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