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# Molecular and isotopic characteristics of source rocks in the early Cambrian of Tarim Basin

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The Cambrian explosion is commonly described as a complex succession of cycles of extinction and radiations [1]. Generally the first stages of the Cambrian radiation of metazoan life and spreading of skeletal reef fauna occurred in the early Cambrian (Terreneuvian and Series 2). However, the carbon isotope and biomarker analyses of the black shale of the Yurtus Formation (>521 Ma) indicate that euxinic conditions prevailed in the palaeowater column during the early Cambrian stage in the Tarim Basin, northwest China.

The biomarkers of the Yurtus Formation are characterised by indicators of stratified water including abundant Gammacerane derived from tetrahymanol and abundant aryl isoprenoids (1-alkyl,2,3,6-trimethylbenzenes). The prevalence of abundant aryl isoprenoids that derived from green sulphur bacteria (Chlorobiaceae) using hydrogen sulfide as electron donor in anoxygenic photosynthesis provides [2] reliable evidence for photic zone euxinic during the early Cambrian in the Tarim Basin. So, the early Cambrian probably inherited the ecological conditions of the Ediacaran in the Tarim Basin. And, it is quite interesting that the Carbon isotope of bitumen "A" in the Yurtus Formation ranges from -30‰ to -28‰, which is much more heavy then that of the kerogen.

An entire distribution of aryl isoprenoids has been discovered in a few oils form marine reservoirs of the Tarim Basin in our laboratory. The carbon isotopes of the aryl isoprenoids are almost all above -19‰. These geochemical evidence offer conclusive proof that the origin of the bulk hydrocarbons is from organic matter deposited in photic zone euxinic (PZE), which is the dominant sedimentary context in the early Cambrian of the Tarim Basin.

Reference:

[1] Knoll, A. and Walter, M., 1992. Latest Proterozoic stratigraphy and Earth history. Nature 356, 673–678.

[2] Grice K., et al., (2005) Photic zone euxinia during the Permian–Triassic superanoxic event. Science 307, 706–709.