Accretion of a volatile rich late veneer recorded by CI chondrite-like S/Se and Se/Te in the Earth's mantle

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The history of delivery of volatile elements is of fundamental importance for understanding planetary evolution (Albered, 2009). The detailed origin and history of moderately volatile and atmophile elements in the Earth remains uncertain. The excess of highly siderophile elements (HSE) and chondritic ratios of most HSE in the bulk silicate Earth (BSE) may reflect accretion of a chondritic late veneer of about 0.5 % of Earth's mass after core formation[1,2]. The proportion of volatiles delivered by the late veneer is a key constraint for the budget and the origin of the volatiles in the Earth. At high pressure-temperature conditions, the moderately volatile chalcogen elements S, Se and Te with rather low 50 % condensation temperatures near 700 K are moderately to highly siderophile, thus, if depleted by core formation, their mantle abundances should reflect the composition of the late veneer[3]. Here we determined ratios and abundances of S, Se and Te in the mantle based on new isotope dilution data for post-Archean mantle peridotites with negligible low-temperature alteration. Infiltration and trapping of silicate melt in peridotites have very similar effects on abundances of S, Se and Te as partitioning during open system melting[4,5]. The mean S/Se (2690±700, 1σ) and Se/Te (7.9±1.6, 1σ) of mantle lherzolites overlap with CI chondrite values[6]. In contrast, Se/Te of ordinary and enstatite chondrites are significantly different (11-30)[7]. The chalcogen/HSE ratio of the BSE is similar to CM group carbonaceous chondrites, consistent with the view that the HSE signature of the BSE reflects a mixture of slightly volatile depleted carbonaceous chondrite and minor non-chondritic material[8]. Depending on the estimates for the abundances of water and carbon in the BSE (Marty 2012), the late veneer may have supplied a significant proportion of the budget of hydrogen and carbon in the BSE.

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Origin of deep gas and oil cracking gas potential in Tarim Basin, China

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The marine strata in China is of old age and in high evolution period, and the potential of gas generated from high-overmature source rocks is limited, but the gas exploration of this marine strata in Tarim basin has greatly effective with large gas fields constantly discovered.

This paper brings up the successive gas generation machanism for the origin of deep marine gas, including three meanings of transformation of gas generation matter, replacement of gas generation time,and change of gas source kitchen. The gas source kitchen of dispersive liquid hydrocarbon inside of source rocks inherits the characteristics of original gas source kitchen, but the gas source kitchen of dispersive & concentrated liquid hydrocarbon outside of source rocks has occurred the spacial change comparing with original gas source kitchen. The above three liquid hydrocarbon can be cracked into gas at high-over mature stage, but the latter is embeded flatter and its time of cracking and gas generation is later than the former, which makes for the late gas accumulations.

This paper creates expulsion oil rate plates of different organic matter abundance through simulation experiments of hydrcarbon generation and expulsion of different organic matter abundance and different lithology source rocks, providing the basis for the reasearch of allocation proportion and quantity of dispersive liquid hydrocarbon inside & outside of source rocks.

This paper demonstrates the quantity, distribution and cracking degree of dispersive soluble organic materials of palaeozoic strata in Tarim basin from the evaluating indicator S_1 of hydrocarbon generating potential, heat-origin asphalt and the fluorescence characteristic of reserviors, and makes sure of the reality of successive gas generation of organic matter of palaeozoic marine source rocks in Tarim basin, and also calculates the cracking gas quantity of dispersive soluble organic matter in middle and lower Cambrian of Tarim basin. The application of successive gas generation mechanism of organic matter can greatly increase the gas exploration potential and hopeness of palaeozoic strata in Tarim basin,China.

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