The organo-clay complexes in source rocks—a natural material of hydrocarbon generation

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It is well-known that a kerogen, separated by demineralization from source rocks, is the main material of hydrocarbon generation. However, during this process, the feature of occurrence and the associations of organic matter with clay minerals are destroyed. Therefore, we extract organo-clay complexes (< 2μm) from crushed source rocks in depth 1000-3500m, Shahejie Formation, Oligocene, Jiyang sag, east China, and study its characteristics and potential of hydrocarbon generation. The complexes is mainly composed of interstratified illite-smectite (I-S) and illite minerals, and its value of TOC is 2.62-9.78%. Its value of TOC treated by H_2O_2 is still up to 1.23-4.63%, which suggests an enrichment of organic matter in the complexes. The diffraction peak (d001) of complexes is 1.3-1.4nm at 250°C, and move to 1.0nm until heating to 550°C in XRD curves, and the exothermic peaks of complexes with extraordinary stable occur at 350°C in DTA curves. This information is consistent in the XRD and DTA observations, and it is a symbol characteristic that an organic matter can enter in the interlayer space of clay minerals. With PY-GC analysis, the organic matter is released in temperature range 250-650°C, mainly at about 450°C, and the components is consistent with higher content of C_5 and C_{25} in the complexes and source rock. Our findings indicate that organic matter can enter interlayer of clay minerals forming natural and highly stable organo-clay complexes. Also the composition of organic matter in the complexes is similar to crude oil. These results suggest that an organo-clay complexes is a natural material and plays an important role in organic matter preservation and hydrocarbon generation in source rocks.

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Estimating submarine groundwater discharge into Xiamen Bay (China) using naturally-occuuring Radium isotopes

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It has been suggested that the submarine discharge of chemical species carried by groundwater has been found to be significant, eventually having considerably impact on coastal biogeochemistry and ecosystems. Chemical tracers of Submarine groundwater discharge (SGD), such as radium isotopes, have the advantage of integrating this process over a wide range of spatial scales from the continental shelf to individual estuaries.

In many coastal regions, SGD is a potentially important process for delivering a wide range of anthropogenic contaminants, including nutrients, to coastal waters. The objective of our study is to quantify SGD into the coastal seawater of Xiamen Island, China, via interpretation of a unique set of radium data spanning nearly several years.

In this paper, concentrations of ^{224}Ra, ^{226}Ra, ^{228}Ra,δD and$\delta^{18}O$ of seawater and coastal groundwater in the Bay of Xiamen were measured to study SGD.

The δD, $\delta^{18}O$ data of the coastal groundwater were found to increase from land to the sea, which revealed the coastal groundwater flows into the sea. This is supported by the result of hydrological study in the same area.

Then, based on a Radium isotopes mass-balance model, the advective flux of ^{228}Ra through SGD was calculated to be 3.84 Bq m^{-2} d^{-1} in the studied area, while the rate of SGD (mostly brackish groundwater) was estimated to be about 1.4×10^9 m^3/a, at least 12% of the input of Jiulong River, which is the second largest river in the Fujian Province, China.

Although there are large uncertainties in this estimate, it is obvious that SGD is potentially an important route in this area. In addition, SGD appears to be important source of N and P (together with other nutrients) in the coastal Seawater of Xiamen Island. This result from such a representative area implies that the N and P flux through SGD may be significant in the large area of the south of China.