

## The roles of inorganic minerals on the oil and gas generating processes

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The laboratory studies previously have show that the activation energies for thermal cracking of macro-organic molecules to light hydrocarbons are much higher than that in nature. These observations have led geologists believe that there must have some catalysts in nature which lower the activation energies for oil and gas generating reactions and make oil and gas generating reactions happened or make them accelerated. In this study, a coal sample was separately heated with kaolin, CaCO<sub>3</sub>, Fe<sub>3</sub>O<sub>4</sub>, FeS, S and without any minerals at temperatures of 250°C to 600°C in closed hydrous pyrolysis systems for 72 h. The results show that inorganic minerals have considerable affects on oil and gas generating processes. The coal can produce much more bitumen "A" when it was heated with kaolin, CaCO<sub>3</sub> and FeS respectively than without any minerals and it can also produce more gas products when it was heated with kaolin, CaCO<sub>3</sub> and S than without any minerals. The carbon isotopic compositions of gas hydrocarbons produced from the coal are also greatly different when the coal was heated with and without minerals. In most cases, the coal produce relatively lighter ethane on carbon isotopic compositions when it was heated with minerals than that of without any minerals.

This study indicates that thermal reaction is a very important factor during the oil and gas generating processes, but mineral catalysis or delay affects also play important roles in those processes. So we should pay more attention on mineral catalysis/delay affects as well as thermal reactions on oil and gas exploration.

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## Expulsion of overpressure fluid flow along faults: Geochemical evidence of pore water in the Yinggehai basin, South China Sea

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More than 100 pore water geochemical analyses from 26 wells in the Yinggehai, northern South China Sea margin have been carried out. These samples are collected from Miocene and Pliocene rocks forming in nearshore, neritic, shelf environments. Three kinds of pore water salinity domain could be recognized: non-diapiric area, diapiric area within normally pressured system and overpressured area. Salinity of water in the non-diapiric area ranges from 30g/L to 38g/L, which is equal to or slightly greater than that of normal seawater. In the overpressured system, however, formation water has much lower salinity about 9.9-31.6g/L and ion concentrations (except bicarbonate and carbonate) than normal seawater. The largest variation of salinity ranging from 10.3g/L to 35.9g/L occurs at the diapiric area with normally pressured system, which is related to strong multiple expulsion fluid from overpressured compartments in diapiric structures.

The results indicate that NaHCO<sub>3</sub>-dominated water with lower salinity at overpressured strata resulted from the dilution of new-born water from clay transformation, such as the illitization of smectite. High bicarbonate and carbonate concentrations may contribute to mineral dehydration and kerogen-cracking reactions. Strong expulsion of fluid from deep overpressured sediments with low salinity could be explained the variation of salinity in pore water at the top of the overpressured zone in the diapiric structures. The magnitude of TDS and HCO<sub>3</sub> and CO<sub>3</sub> concentrations depend on the distance from the vertical faults connected with the overpressured compartments. The shorter the distance to the vertical faults, the smaller the TDS content is, and the greater the HCO<sub>3</sub> and CO<sub>3</sub> concentrations. Therefore, variation of salinity and ion concentrations in different pressured systems provides a clue to infer the flow pathways and possible diagenetic reactions.