EFFECT OF CLAY MINERAL PARTICLE SIZE COMPOSITION ON ORGANIC CARBON OCCURRENCE IN CLAY AQUITARD

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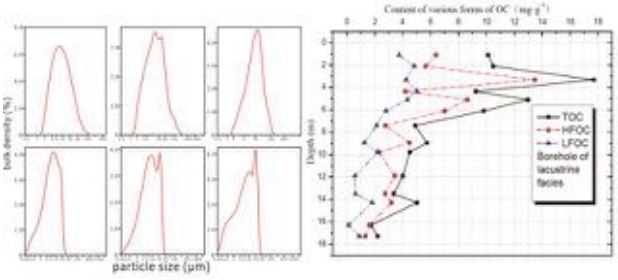
Introduction and Methods

Aquitard is an important part of aquifer system, which has an important impact on groundwater quality and quantity. Organic carbon (OC) is an active element involved in biogeochemical reactions in aquitard. We analyzed the influence of sediment particle size and clay mineral types on OC occurrence by collecting and analyzing borehole samples under three different sedimentary environments.

Discussion of Results

According to the particle size frequency curve (Fig. 1a), the most stable is presenting mostly in single peak. And total OC content ranged from 1.72 to 17.71 $mg \cdot g^{-1}$, which decreases with depth in a fluctuating manner (Fig.1b). The sediments of alluvial facies (1.77~19.57 $mg \cdot g^{-1}$) and slope facies (1.44~4.37 $mg \cdot g^{-1}$) have two peaks, three peaks and other types as well so hydrodynamic conditions are unstable and the contents vary greatly in different depths. The correlation analysis shows that clay particles and fine particles have important effects on the preservation of OC, including adsorption and agglomeration.



(a) (b)

Figure 1: a. Particle size frequency curve. b. The forms and content of OC in different depths of lacustrine facies strata

The 2:1 clay minerals (such as montmorillonite and illite) have stronger ability to stabilize OC than 1:1 clay minerals (such as kaolinite). Heavy fraction of OM is the main form of OM binding to clay minerals ($R = 0.626$, $P < 0.05$). The adjacent crystalline layers along the C axis of kaolinite are connected by strong hydrogen bonds, so there is no inner surface. The crystalline layers of 2:1 clay minerals are connected by weaker van der Waals force, and the water molecules can enter the layers, thus it would form an inner surface which can absorb water and expand to has a larger effective area.