

Experimental study of earlier formation processes of macerals

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1. Introduction

A continued variation process from plant to peat and soft brown coal has not been reported although peat and brown coal macerals have been studied by many people (Taylor *et al.*, 1998; Zhong, 1998). Experimental study of immature oil generation has also been reported by many authors since immature oil has been found (Wu *et al.*, 1994; Wang *et al.*, 1994; Huang *et al.*, 1993; Wang *et al.*, 1996; Wang *et al.*, 1997; Qin *et al.*, 1997). Almost all experiments have been carried out in higher temperatures (more than 200°C) and short times (several hours or several days). Furthermore, catalyses of different elements or compounds were not considered in most experiments.

Organic matter decay or immature oil generation occurs in a temperature of lower than 80°C by biochemical reaction. Previous experiments under higher temperatures cannot simulate biochemical reactions. The purpose of this study is to simulate the earlier formation processes of macerals and sulfides under lower temperature (<80°C) and in long time (4 year). In the same time, catalysis of several elements/compounds has been considered in the experiments.

2. Simulation methods

12 samples were simulated in a constant temperature box since August 1, 2002. Coniferae branch and bark were used as organic source (Table 1). The simulation temperature keeps constant at 80°C.

Simulation materials are: kaoline, quartzose sand, copper powder, iron powder, lead powder, zinc powder, coniferae branch and bark, gypsum. These materials have different ratios in 12 samples. Every sample has unique condition (Table 1). These materials were put in different bottles. In the bottom of the bottles are quartzose sand sheet. Kaoling, organic matter, gypsum, salt and metals were mixed and put on the sand. Another quartzose sand sheet was covered on the mixed materials. Then pure water was poured into the bottles. 2 cm water depth from water surface to samples is kept always.

3. Analysis methods

The samples were taken out from the bottles on August 17, 2003 for first time microscope analysis. Only a small part of each sample was taken, and the rest were kept in the bottles for continues simulation. The samples were analyzed by microscope in the Open Laboratory of Organic Geochemistry, Institute of Geochemistry, Chinese Academy of Science, Guangzhou.

The samples were taken out from the bottles on August 17, 2004 for second time analysis of microscope in the Open Laboratory of Organic Geochemistry, Institute of Geochemistry, Chinese Academy of Science, Guangzhou.

The samples were taken out from the bottles on August 17, 2005 for third time analysis of microscope in the Open Laboratory of Organic Geochemistry, Institute of Geochemistry, Chinese Academy of Science, Guangzhou.

The samples were taken out from the bottles on August 17, 2006 for fourth time analysis of microscope in the Open Laboratory of Key Laboratory of Coal Resources, China University of Mining and Technology (Beijing).

Organic petrographic composition was investigated on polished block samples using a Leitz MPV3 reflected light microscope equipped with a halogen lamp.

4. Results

Organic matter has become cutinite, subnitine and huminite after one year simulation (2003). Cutinite and subnitine