

# Experimental Simulation of Organic Acids Generation of Microbial Carbonates — Composition, Amounts and Role in Mesogenetic Dissolution

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## Abstract

Microbial carbonates are currently important target strata for oil and gas exploration in China, e.g. Dengying Formation of Sinian in Sichuan Basin, Majiagou Formation of Ordovician in Ordos Basin and Paleogene in Qaidam Basin. Many researches were conducted to further the understanding of the origin and development of nonmarine to marine microbial carbonates, the nature of the depositional and diagenetic characteristics of microbialite and associated facies, and the sedimentary and petrophysical properties of microbial carbonate petroleum reservoirs. Microbial carbonates usually contain organic matter. Some authors have proposed that slope facies could act as source rocks according to the biomarker and TOC data. However, geologists focus less on whether microbial carbonates produce the organic acids during thermal maturation, what is the quantity and how much porosity the dissolution can raise. To investigate the organic acids generation ability of microbial carbonates, thermocompression experiment was performed to simulate organic acids generation of microbial carbonates and mesogenetic dissolution were discussed on the basis of the experimental data. In this study, the sample was stromatolite limestone from Paleogene in Qaidam Basin. The data of organic geochemistry was that TOC=0.288%, S1=0.04 mg/g, S2=0.18 mg/g, HI=60 mg/g, Ro=0.42%. Experimental temperature and pressure were simultaneously varied from (280°C, 45MPa) to (380°C, 79MPa) to stimulate the gradual burial process. For each batch experiment, the

weight of sample was 120g and reaction time was 24h. The fluid was distilled water. Monocarboxylic acids (C1-C4) in the experimental aqueous solution were measured by ion chromatography. The results show that the total contents of monocarboxylic acids (C1-C4) are from 149 mg/L to 1160mg/L. The content of organic acids is the highest in (360°C, 69MPa). The contents of monocarboxylic acids in turn are C1>C2>C3>C4. According to Stephen N. Ehrenberg's model and our experimental data of carbonate rock dissolution, the organic acids produced by stromatolite limestone can increase porosity by 0.5~1.5%. R. C. Surdam reported that the organic acid anions typically dominated alkalinity and significantly affected carbonate stability from 80°to 120°C in sandstone reservoir. The acetate buffer is much more effective than any of the carbonate species. It can be deduced that organic acids produced by microbial carbonates can inhibit cementation during burial to preserve porosity.