

The Effect of Sodium Carbonate on Organic Evolution and Hydrocarbon Generation in Alkaline Salt Lake

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Abstract

The alkaline petroliferous basin which has a high yield of oil and gas, such as the Wilkins Peak Section of the Green River Formation and the second member of the Hetaoyuan Formation in Biyang Sag, Nanxiang Basin is studied. Trona is visible in alkaline lake basins, while mudstone containing high abundance of organic matter is interbedded with dolomite. The view that organic acids can be converted to the sodium salt in the stratum is mentioned a lot in literature, yet, it is still resting on a simple concept without an in-depth study. As a result, a series of problems plague the petroleum geologists and prospectors, such as the conflict between the abundance of organic matter and bitumen conversion rate, evaluation index, exploration target selection, etc.

It is well-known that sodium is easy to react with fatty acid, while if it can react with other organic acids? For this purpose, the following experiment is carried out: dissolve 2.5g anhydrous sodium carbonate in 80ml distilled water, then add 30mg humic acid, stearic acid and palmitic acid, and heated with stirring at 75° for 2 hours. The result showing that all organic acids react with the anhydrous sodium carbonate (saponification reaction). This reaction is completed in only two hours, while at a high concentrations or even saturation of sodium carbonate natural lake (the Soda Lake), it will take more fully natural saponification reaction with a long geological time. The biological activity will greatly reduce after organic acids turn into sodium salts, accordingly, the anti-biodegradable ability will enhance, thus conducive to the preservation, which may be one reason for the high abundance of organic matter in the alkaline lake. And due to the formation of the monovalent sodium salt, organic acids tend to disperse in sodium carbonate solution, which may be the important reason for high asphalt conversion rate of source rock in Carbonate Salt Lake. Predictably, the important changes for organic matter of the distribution, thermal evolution, and hydrocarbon generation will occur after saponification reaction.

A modern alkaline lake and a high yield of oil sedimentation developed in ancient alkaline lake are chosen for study, for which a comparative analysis of organic matter and hydrocarbon simulations are taken. As a result, how sodium carbonate acts on the organic hydrocarbon evolution generation in alkaline environment is learned.