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摘要:

古温标是恢复沉积盆地热演化历史的重要指标之一。目前, 有众多的古温标用于碳酸盐岩层系热历史的恢复, 既有沥青反射率(R_b)、牙形石色变指数(CAI)、镜状体反射率、有机质自由基浓度(N)、激光拉曼光谱等有机质古温标, 也有矿物的裂变径迹热定年、岩石声发射、伊利石结晶度等矿物古温标, 但他们都有不同的适用范围。本文针对有机质自由基浓度作为古温标在碳酸盐岩层系热历史恢复中的应用进行了探索研究。根据不同受热时间和加热温度下的热模拟试验, 分析了型和型有机质的自由基浓度的热演化特征, 得到了自由基浓度与时间-温度(TTI)的定量关系; 由此建立了自由基浓度(N)与时间-温度(TTI)的定量模型并将之应用于塔里木盆地TZ12井的热历史研究。依据自由基浓度古温标模拟得到的TZ12井区奥陶纪时期的古地温梯度为3℃/100m左右, 该结果与前人对该地区热史研究的结论及本研究中依据磷灰石裂变径迹模拟的结果相一致。对于经历了多期构造运动的下古生界碳酸盐岩层系的热史恢复, 最好是多种古温标并用, 多种方法综合运用, 才能精确地恢复有机质的热演化史。

关键词: [碳酸盐岩](#) [古温标](#) [有机质自由基](#) [磷灰石裂变径迹](#) [热历史](#)

Study on the Geothermometer of Free Radicals in Organic Matter for the Reconstruction of the Thermal History of Marine Carbonate Succession [Download Fulltext](#)

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Abstract:

The geothermometer is one of the most important methods for reconstructing the thermal history of sedimentary basins. Many geothermometers have been employed to study the thermal history of carbonate succession, including organic indicators, such as bitumen reflectance(R_b), CAI of conodonts, reflectance of vitrinite-like macerals, free radicals density, laser-Raman carbon geothermometer; and mineral indicators, such as fission track thermochronology, illite crystallinity, acoustic emission of rocks. However, all these geothermometers have their own scopes of application. Based on thermal simulation results of type I and type II kerogen, this paper discusses the application of free radicals concentration as the thermal indicator for reconstructing the thermal history of carbonate succession. A series of free radicals data were tested under thermal simulation at different heating temperatures and times, and quantitative models between free radical concentration(N) of organic matter and time-temperature(TTI) for type I and type II kerogen were obtained. This N-TTI relation was used to model the Ordovician thermal gradients of Well TZ12 in the Tarim Basin. The modeling result is corresponding to the results obtained by apatite fission track data and previously published data. After all, to study the thermal history of the Lower Paleozoic carbonate succession, which has undergone complex structural movement, we had better employ a number of thermal indicators and geothermometers together.

Keywords: [carbonate succession](#) [geothermometer](#) [free radicals of organic matter](#) [apatite fission track](#) [thermal history](#)

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