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石英热释光——沉积盆地热史研究中另一种潜在的古温标

龚革联¹, 李盛华², 孙卫东¹, 郭锋¹, 夏斌¹, 吕宝凤¹

1 中国科学院广州地球化学研究所, 广州 510640

2 香港大学地球科学系, 香港

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摘要 具有良好重现性的石英热释光信号除了用于近地表的考古及地质事件定年以外, 还能反映一定地质时间范围内的环境温度变化规律. 本文利用砂岩中石英矿物的热释光信号, 采用传统热释光分析和等温热释光方法, 以东营凹陷中央背斜带钻孔岩芯为例, 探讨对沉积盆地热体制信息的指示意义. 研究表明: (1) 钻孔中不同埋深位置的石英矿物, 其自然热释光发光曲线有规律变化, 与所对应的环境地层温度以及热释光发光动力学相符, 即随着沉积地层埋深增加、埋藏温度上升与埋藏时间加大, 其热释光发光曲线整体向高温方向移动, 而发光强度明显减小; (2) 石英热释光多片增加分析方法以及等温热释光分析方法所获得的表征年龄彼此印证, 通过表征年龄的换算, 定性或半定量获得描述沉积盆地热演化史的环境古温度变化的一个等效参数——表征温度, 该表征温度能够表征沉积盆地一定地层范围内, 一段埋藏历史的古温度变化历史. 石英热释光信号是沉积盆地热史分析中一种潜在的古温标, 对于石英热释光表征年龄与表征温度地质意义的诠释, 仍需要更多的研究事例加以佐证.

关键词 [石英](#) [热释光](#) [盆地](#) [热体制](#) [表征年龄](#)

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Quartz thermoluminescence—another potential paleothermometer for sedimentary basin thermal history study

GONG Ge-Lian¹, LI Sheng-Hua², SUN Wei-Dong¹, GUO Feng¹, XIA Bin¹, L Bao-Feng¹

1 Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China

2 Department of Earth Sciences, The University of Hong Kong, Hong Kong, China

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Abstract Good reproducibility of quartz thermal stimulated luminescence phenomenon offers the possibility of dating geological events in subsurface and exploring environmental temperature history as well. As sandstones in basins generally experience one certain pattern of thermal history due to effects of temporal and spatial dependent temperature field, the quartz minerals extracted from these sandstones were evaluated to explore the thermal regime structure information by thermoluminescence analyzing technique. The mean quantitative temperature field information in terms of equivalence for certain burial depths in petroleum basin was investigated using both quartz thermoluminescence apparent age method and laboratory isothermal thermoluminescence simulation measurements. It is recognized that: (1) the variations of both thermoluminescence glow-curve pattern and intensity of certain natural thermoluminescence peaks correlate well with environmental temperature field in corresponding burial depths where the quartz was extracted from. The quartz natural thermoluminescence glow-curves peaks shifting to high temperature and the thermoluminescence intensity reduction result from the increase of both environmental temperature and burial time for quartz due to deepening burial depth; (2) both the additive dose thermoluminescence (TL) and isothermal TL (SA-ITL) techniques were used for quartz mineral TL dating and the resultant apparent ages agree well with each other, and thus one parameter called equivalent temperature was tentatively presented and deducted from apparent TL ages of quartz minerals to evaluate the basin's thermal regime structure information. Quartz thermoluminescence signal can be recognized as one potential paleothermometer if the well correlation of calculated equivalent temperature of buried quartz mineral with other paleothermometers can be supported by more future independent geological evidences.

Key words [Quartz](#); [Thermoluminescence](#); [Basin](#); [Thermal regime structure](#); [Apparent age](#)

通讯作者:

龚革联 ggl@gig.ac.cn

作者个人主页: 龚革联¹; 李盛华²; 孙卫东¹; 郭锋¹; 夏斌¹; 吕宝凤¹

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