OSL-thermochronometry using bedrock quartz: a note of caution

Optically stimulated luminescence (OSL) thermochronometry is an emerging application, whose capability to record sub-Million-year thermal histories is of increasing interest to a growing number of subdisciplines of Quaternary research. However, several recent studies have encountered difficulties both in extraction of OSL signals from bedrock quartz, and in their thermochronometric interpretation, thus highlighting the need for a methodological benchmark. Here, we investigate the characteristic OSL signals from quartz samples across all major types of bedrock and covering a wide range of chemical purities. High ratios of infrared to blue stimulated luminescence (IRSL/BLSL), an insensitive 'fast' OSL component, and anomalously short recombination lifetimes seen in time-resolved luminescence (TR-OSL), are often encountered in quartz from crystalline (magmatic and metamorphic) bedrock, and may hamper successful OSL dating. Furthermore, even when the desirable signal is present, its concentration might be indistinguishable from its environmental steady-state prediction, thus preventing its conversion to a cooling or heating history. We explore the saturation properties and the thermal activation parameters of various OSL signals in quartz to outline the capabilities and limitations for their use in low-temperature thermochronometry. [All rights reserved Elsevier].

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