

Supplementary

Methodology

1. **Electron probe microanalysis (EPMA)** was conducted on the rocks to obtain quantitative compositional mapping of mineral phases. Small rock fragments were embedded in a mold with a 1-inch diameter and submerged in a mixture of epoxy. The epoxy mixture was prepared by combining 3 g of Epoxy Hardener (EpoThin 2) with 6 g of Epoxy Resin (EpoThin 2), and left to dry overnight at room temperature. Once dry, the samples were ground and polished automatically using the MetaServ 250 Grinding/Polishing machine by Buehler. This process involved three steps with sandpaper of different grit sizes: 240, 600, and 1,200. Each step lasted for 10 minutes. Following this, a fine polishing step was carried out using oil-based monocrystalline diamond suspensions of 3 μm and 1 μm , rotating for 15 minutes and 10 minutes, respectively. The rotating polishing disks were set at a speed of 200 rpm. After each polishing step with the diamond suspension, the samples were immersed in isopropyl alcohol and sonicated for 2 minutes to remove any excess suspension. Finally, a 15 nm carbon coating (Edwards Coating System—E306A) was applied to the samples prior to analysis. The analysis itself was performed using the JEOL JXA-8230 EPMA (JEOL, Japan) instrument. The operating conditions included an accelerating voltage of 15 kV, a beam current of 10 nA, and a focused beam width of 10 μm . The counting time for each peak ranged from 10 to 60 seconds, while the background was measured for 5 to 30 seconds. Mineral compositional mapping was calculated using internal standards for elemental composition. The dolomite phase was additionally verified using a secondary standard (806 dolomite sx2). The standards used for quantifying elements in the single point analyses of dolomite were (803 dolomite PS-89/6) for Mg and Ca, (226 haematsx1). The elements were quantified in their oxide forms, and the CO₃ content was calculated based on the dolomite standard. For imaging and spectral analysis, PC-EPMA software v1.15.0.0 (JEOL, Japan) was employed.
2. **Thin sections** were created from the Epoxy-embedded samples that were utilized for EPMA. The embedded samples were affixed to frosted petrographic glass slides using adhesive. To achieve a thin layer on the slide, the main part of the sample was cut using a diamond saw (IsoMet 4000). The samples were then ground using a PetroThin Thin Section Machine to achieve a flat surface on the slide. Subsequently, the slides were placed in a lapping and polishing machine (LOGITECH, LP30), utilizing silicon carbide with a grit size of 600 (15 μm grain size), to achieve a sample thickness of 30 μm . An automated polishing system employing an oil-based diamond suspension was used in three consecutive steps: first at 9 μm , then 3 μm , and finally 1 μm , with each step lasting for 5 minutes. The polishing process was carried out using the MetaServ 250 Grinding/Polishing machine by Buehler, at a speed of 200 rpm.