

NEW APPLICATIONS OF ACCESSORY MINERALS IN METAMORPHIC PETROLOGY

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ABSTRACT: Laser ablation (LA)-ICP-MS has become readily available during the last decade, making in-situ trace element analysis as routine as, for example, electron microprobe (EMP) analysis. The impact of such opportunities in Earth Sciences is only slowly appearing on the horizon. I will review only the research trends in the field that deal with accessory minerals in metamorphic petrology.

High field strength elements (e.g., Ti, Zr) have long been thought to be among the most immobile elements. Therefore, it came as a surprise that such trace elements in accessory minerals are extremely suitable for geothermobarometry of metamorphic rocks. Especially the rutile thermometer (Zr-in-rutile in coexistence with zircon and quartz) has found widespread acceptance after being introduced to the scientific community less than a decade ago.

More recently, it has been realized that diffusion of Nb in rutile is fast enough, at high grade metamorphic conditions, to be resolvable by EMP and LA-ICP-MS. This allows for the derivation of reaction rates under a wider range of conditions.

For a long time, U/Pb dating was the most prominent application of accessory mineral studies in metamorphic rocks. This tendency holds true today, based on the fact that more and more techniques are developed to read the mineral record. Traditionally, zircon and monazite were the only dated accessory minerals in metamorphic rocks. Now, protocols have been implemented that allow for the extraction of reliable age information from a much wider suite of minerals (e.g., rutile, titanite, apatite, xenotime).

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