Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18381

U-Pb dating of metamorphic Ilmenite by LA-ICPMS

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In the last decade, the in-situ U-Pb dating of low-U minerals (<5-10 µg/g) has become a cutting-edge technique in the field of geochronology. This method has already been applied to minerals such as carbonate and garnet, and has had a substantial impact on various research fields such as basin evolution studies, ore deposits, structural geology or constraining the metamorphic events of a particular region.

Thompson et al. (2021) presented the first LA-ICPMS U-Pb dating of ilmenite associated with kimberlitic and magmatic rocks. These rock types generally contain ilmenite crystals sufficiently large to be analysed with relatively large laser spot sizes of ca. 100 µm. On the contrary, metamorphic ilmenite is usually present as tiny tabular crystals, which rarely allow for spot sizes larger than ca. 50 µm.

In this communication, we present the U-Pb dates of metamorphic ilmenite from different low to medium-grade metamorphic rocks. The U and Pb isotopes were collected using a Neptune Plus MC-ICP-MS coupled to a RESOLution-LR ArF Excimer laser, measuring the masses ^{206}Pb and ^{207}Pb with Secondary Electron Multipliers (SEMs), ^{202}Hg and ^{204}Pb with the Multiple Ion Counters (MICs), and ^{238}U either with a MIC or Faraday, depending on the U concentration. This analytical setup allows us to analyse U-rich ilmenite with small spot sizes (≤50 µm) or to analyse U-poor ilmenite crystals, which are otherwise not dateable, with larger spot diameters (Beranoaguirre et al., 2021). Our results show that this technique produces ilmenite U-Pb ages that are within the uncertainty of previously determined zircon/monazite U-Pb or garnet Sm-Nd ages from the same samples. This method, therefore, opens up the possibility for dating low to medium-grade metamorphic events, complementing the age information obtained from other phases, or dating lithologies that may lack traditional accessory minerals like zircon or monazite.

Beranoaguirre, A. et al. (2021), *Goldschmidt 2021*, https://doi.org/10.7185/gold2021.7247

Thompson, J.M, et al. (2021), *J. Anal. At. Spectrom.* 36, 1244-1260. https://doi.org/10.1039/D1JA00069A