

## **Age determination of oriented rutile inclusions in sapphire and of moonstone from the Mogok metamorphic belt, Myanmar**

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### **ABSTRACT**

The Mogok metamorphic belt (MMB), Myanmar, is one of the most well-known gemological belts on Earth. Previously, <sup>40</sup>Ar/<sup>39</sup>Ar, K-Ar, and U-Pb dating have yielded Jurassic-Miocene magmatic and metamorphic ages of the MMB and adjacent areas; however, no reported age data are closely related to the sapphire and moonstone deposits. Secondary ion mass spectrometry (SIMS) U-Pb dating of acicular rutile inclusions in sapphire and furnace step-heating <sup>40</sup>Ar/<sup>39</sup>Ar dating of moonstone (antiperthite) in syenites from the MMB yield ages of  $13.43 \pm 0.92$  and  $13.55 \pm 0.08$  Ma, respectively, indicating both Myanmar sapphire and moonstone formed at the same time, and the ages are the youngest published in the region. The ages provide insight into the complex histories and processes of magmatism and metamorphism of the MMB, the formation of gemstone species in this belt, and the collision between India and Asia. In addition, our high field strength element data for the oriented rutile inclusions suggest an origin by co-precipitation rather than exsolution. In situ age determination of this nature is particularly significant since rutile inclusions in other gemstones, such as rubies, can be used to help constrain the geological history of their host rocks elsewhere.

**Keywords:** Rutile inclusion, moonstone, Mogok metamorphic belt, geochronology, syenite