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Hong Kong conference on identification test for copper-bearing gemstones

GRS hosts a conference in Hong Kong on Identification test for Copper-bearing gemstones using copper-isotope ratio determinations by Femtosecond Laser Ablation-MC-ICP-MS

Abstract

Identification Test for Copper-bearing Gemstones (Copper-Andesine and Paraiba-type Tourmalines) Using Copper-Isotope Ratio Determinations by Femtosecond Laser Ablation-MC-ICPMS

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Cu-bearing gemstones including Cu-bearing Plagioclase (Andesine) from China (Tibet and Inner Mongolia), USA (Oregon), Cu-diffused Andesine from Mongolia as well as Cu-bearing Tourmalines from Mozambique and Brazil (Paraíba) have been analyzed for trace elements using LA-ICP-MS and isotope ratios using Femtosecond-LA-MC-ICP-MS. Cu-bearing Andesine and Paraíba-type Tourmalines from different provenances can be distinguished on the basis of trace- and minor element concentrations.

In some cases, especially the Andesine samples, concentration differences were however small. Therefore, Cu isotopes were measured as an additional indicator for natural and treated samples. Natural Cu-Andesine from Tibet and diffusion-treated Andesine from Mongolia were analysed by fs-LA-MC-ICP-MS and standard sample bracketing using NIST610 glass as external standard. The composition of the Andesine, especially the Cu concentration, was very similar to that of NIST610. The results indicate that treated samples provide a similar or negative d65Cu/63Cu value compared to NIST610, whereas the untreated samples from Tibet were always found to have a positive bias. Negative d65Cu/63Cu values can be interpreted as being produced by copper-diffusion effects, where the lighter isotope diffuses preferentially in comparison to the heavier isotope.

The Cu isotopes were also analysed in Paraíba-type Tourmalines. The analysed samples from Paraíba show very similar d65Cu/63Cu ratios, positively biased to NIST610. Therefore, it can be assumed that diffusion-treated Paraiba-type materials will be distinguishable from natural

stones. A much more significant isotope variation was found in the Mozambique Tourmalines, which will need further investigation.

Considering the importance of trace elements determined by LA-ICP-MS for origin and provenance studies, it can be assumed that Cu and other isotope ratios will be become a very important new test tool for gemmology, especially when it comes to controversial reports on diffused vs. non-diffused original color analyses in these types of gemstones.

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