

Distribution of Radionuclide Impurities in Irradiated Topaz

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Irradiation is one of the most efficient techniques to enhance gemstones, and color enhanced topaz is the best example of commercial application of neutron irradiation. After irradiation the color of topaz turns into deep blue resulting in so-called London blue topaz. However, neutron irradiation induces radionuclides of different half-life time and thus causes radioactivity of the gemstones. For color enhanced topaz it may take up to several months for residual radioactivity to reach a safe level. This period depends on several factors, such as chemical composition of the topaz and the type of irradiation. The residual activity may significantly vary among topaz samples even if they have originally been obtained from the same deposit.

We present results of spectroscopic analysis of about 400 irradiated topaz samples. Large variation in residual activity measured in several months after the irradiation is observed. Different types and different concentration of radionuclides are identified. To optimize the color enhancement procedure and to reduce the storage time required to reach the safe level of residual activity, a post-irradiation sampling is proposed.