Ideal Source Quality Assurance

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Request for amendment to License 24-32675-02E

To include Na-22 in the SOR calculations for exempt release

The activation of topaz minerals by neutrons has been well established through years of experience. The principle isotopes (with half-lives greater than a few days) generated by neutrons are Sc-46, Mn-54, Ta-182 and Co-58 (although this is rarely observed in stones with even modest storage for decay-greater than 6 months). Irradiation with electrons with energy less than 10 MeV is not found to produce observable activation, but the use of higher energies, which is required for large stones to avoid breakage, is found to produce measurable quantities of Na-22. This isotope was not included in the sum-of-ratios calculation required to determine if the activity falls below the exempt limits established by the NRC. To date, we have a large inventory of stones found to contain Na-22. These have been held in storage and not certified for release.

10CFR-30.70 (Schedule A) lists exempt concentrations for isotopes produced by neutron activation, but not those which are produced by electron activation (or by other routes). Those not listed are (nominally) limited to 10^{-6} microcurie per gram, a limit that would affectively prohibit sale of any stones containing observable quantities of Na-22. However, NUREG-1556 Vol. 8, Appendix G provides an alternative for isotopes not specifically listed in 10CFR-30.70 (Schedule A), wherein the exempt release concentration limit is calculated using the formula

$$C = ALI/(3000 \times 365)$$

(3000 is the daily liquid intake for reference man and 365 is the number of days per year). ALI is the annual limit for ingestion.

The tabulation of ALI values for most isotopes (including many not listed in 10CFR-30.70, is found in 10CFR-20 Appendix B. (http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/appb/Sodium-22.html). For Na-22 this is given as 400 microcuries, resulting in an exempt concentration $C = 3.65 \times 10^{-4}$ microcuries per gram (or equivalently 13.5 Bq/gm). We therefore intend to incorporate Na-22 at this limit into

the sum-of-ratios calculations in testing of topaz gemstones for release, both during their initial screening at the Maria reactor, and in the quality assurance testing at ISQA under the terms of the license previously agreed to. Modifications to the program to incorporate this isotope in the calculations are underway, will be tested (using the Ge detector system at the Maria reactor for accuracy) and installed on the Maria and ISQA testing stations as soon as this amendment is approved. In all other respects the procedures established in the License will be followed.

It should be noted that the original application for this license strictly followed the requests for information (and the establishment of compliant programs) given in NUREG-1556 Vol. 8, Appendix G. Inasmuch as these appear not to have changed (no notices from the NRC have been received regarding changes), we can assure the NRC that the licensee is following the guidance given in that appendix, and will continue to do so.