



Fact Sheet

United States Nuclear Regulatory Commission
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IRRADIATED GEMSTONES

The Nuclear Regulatory Commission has received numerous inquiries from the jewelry industry and consumers regarding gemstones (most notably, blue topaz) that have been irradiated in a nuclear reactor or accelerator to enhance their color. These inquiries reflect confusion— and some misinformation – the agency wishes to clear up about the regulation of these stones and their safety.

The NRC has no reason to believe irradiated gemstones currently on the market are unsafe. The NRC has not requested that jewelers take these stones off the market.

Irradiated gemstones fall under the NRC's regulatory jurisdiction because the process of enhancing the stones' color – through bombardment with either neutrons or electrons – can make the gems slightly radioactive. After irradiation, the stones are typically set aside for a couple of months to allow any radioactivity to decay. NRC requires that the *initial distribution* of these stones be by a distributor licensed by the NRC. This distributor would conduct radiological surveys of each batch of gemstones to ensure that any residual radioactivity falls below regulatory limits. After the initial distribution, the stones would no longer be regulated – in other words, subsequent distributors, jewelers, other retailers and consumers do not need to be licensed.

Two factors have contributed to the current market concern. First, the NRC contacted industry representatives earlier this year for information about how irradiated gemstones are reaching the U.S. market. Many gemstones currently are imported and distributed by a number of companies without an NRC distribution license. The NRC has worked with industry groups to re-establish the necessary regulatory framework. Two distribution licenses have now been issued for neutron-irradiated topaz, and other applications are being reviewed.

Second, new NRC regulations take effect Nov. 30 under the Energy Policy Act of 2005, which gave NRC jurisdiction over radioactive materials produced in accelerators. Most of these materials are medical isotopes used in diagnosis and therapy, but the new regulations also apply to irradiated gemstones. (Previously, NRC regulations applied only to gemstones irradiated in reactors.) Information about these regulations and NRC's transition plan for their implementation

is available [here](#) on the NRC Web site. Once these regulations become effective, distribution of all irradiated gemstones will fall under the requirements described above.

The NRC is working to resolve regulatory questions about irradiated gemstones currently on the market. Information about this action will be updated on this page as warranted.

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1. **Why and how are gemstones irradiated?**

Gemstones are irradiated in order to enhance and deepen their color. They can be irradiated in a nuclear reactor (neutron bombardment), an accelerator (electron bombardment), or by exposure to gamma rays in a cobalt irradiator. The most commonly treated stone is topaz, which becomes blue as a result of the exposure to radiation.

2. Does irradiation make the stones radioactive?

Possibly. Generally, the longer the stones are exposed to radiation – and the more intense the radiation – the deeper and more attractive the resulting color; also, this increases the chance that trace elements in the stone will be “activated” and become radioactive. It is important to note that activation is most likely to occur in stones that are treated in a nuclear reactor, though treatment in an accelerator can also make stones radioactive. Treatment in a cobalt irradiator does not render stones radioactive.

3. Is it dangerous to wear blue topaz?

No. The NRC has no indication that wearing irradiated gemstones can be harmful. There have been no reported cases of anyone being harmed by wearing irradiated gemstones.

4. Should I stop wearing blue topaz?

From a safety standpoint, there is no reason to stop wearing blue topaz or any other irradiated gems.

5. A jeweler told me it is now illegal to sell blue topaz because it causes cancer – is this true?

No. There is no reason to believe blue topaz or any other irradiated gemstone poses any health risk, much less cancer. The NRC has not advised, requested or ordered any retailers or distributors to stop selling irradiated gemstones.

6. How can I tell if my jewelry has been irradiated?

A skilled gemologist might be able to tell by examining the gemstone. However, it can be very difficult to determine whether a stone has been treated in a reactor, accelerator or irradiator. Any residual radiation can be detected with a hand-held survey meter; however, determining whether the radiation is below NRC’s regulatory limits requires a trained radiation professional to use sophisticated survey equipment.

7. Will I receive a radiation “dose” from wearing blue topaz or other irradiated gems?

Possibly, but it would be an extremely small dose. A study done by the NRC estimated that a person wearing a blue topaz stone at the highest level of radioactivity allowed for distribution under NRC regulations would receive an annual dose of 0.03 millirem (NUREG 1717, page 2-21). By contrast, a chest X-ray is about 60 millirem.

8. Why is NRC scaring industry and disrupting the sale of irradiated gemstones?

Earlier this year, the NRC contacted several large retailers of blue topaz seeking information about how the stones reached the U.S. market. The agency sought this information in order to restore the regulatory framework for the proper distribution of these gems under the Atomic Energy Act and NRC regulations. The NRC did not request any specific actions of industry. Industry groups and retailers have cooperated with the NRC in its efforts. The NRC continues to

survey batches of stones for radiation. Surveys conducted to date have not given the agency any indication that current inventories are a health risk.

9. Do I need an NRC license to sell blue topaz or other irradiated gems?

Probably not. NRC regulations cover material made radioactive in a nuclear reactor (and, as of Nov. 30, 2007, in accelerators as well). The initial transfer of these materials must be made according to an NRC distribution license. If the radioactivity levels are below certain limits in NRC's regulations, the materials become "exempt" from further regulation, and further distribution, including to the end consumer, does not need to be licensed. This means individual jewelers do not need to be licensed provided the stones they sell were initially distributed by an NRC licensee.

In early November 2007, the NRC issued two distribution licenses for blue topaz, and other license applications are under review.

10. Why is an "exempt distribution" license required for the initial distribution of irradiated gemstones?

The license provides a safeguard against the possibility that stones might reach the market too soon after irradiation, with radioactivity above NRC limits. The distribution licensee is required to perform sophisticated surveys to verify that the stones meet NRC requirements for exempt distribution.

11. Am I selling "contraband"?

No. Current inventories in retail outlets and distribution channels have not been distributed by an NRC licensee, but these should not be considered contraband. The NRC is working to resolve regulatory issues regarding the current inventory of irradiated gemstones.

12. Should I stop selling these popular gemstones?

That is a business decision only you can make. The NRC has sought information from industry about how irradiated gemstones reach the U.S. market, but the agency has not requested any action, including a halt in sales.

13. I read that there was a ban on selling irradiated gemstones. Is this true?

No. When the NRC approached industry groups earlier this year seeking information about the distribution of irradiated gemstones, several retailers pulled their stones from the market in response. This was a voluntary action on their part. The NRC did not request or impose any such action.

14. Why do some irradiated gemstones fall under NRC's authority, while others do not?

This is simply because of the way the law has been written. The Atomic Energy Act gave NRC regulatory authority over radioactive material produced in reactors. In the Energy Policy Act of

2005, Congress extended this authority to include accelerator-produced radioactive material that is used for a commercial, medical, or research activity. NRC regulations implementing this expanded authority take effect Nov. 30, 2007. Information on these regulations and the agency's transition plan for implementing them are available [here](#) on the NRC Web site.

Some stones treated at low energy in an accelerator may not actually become radioactive, so they would not qualify as radioactive material under NRC authority. Also, stones treated in a cobalt irradiator do not become radioactive.

November 8, 2007