



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 believes irradiated gemstones currently on the market are safe.
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 in early 2007 for information about how irradiated gemstones are reaching the U.S. market. Many gemstones on the market were 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. In November 2007, three distribution licenses were issued, and other applications are being reviewed.

Second, new NRC regulations took 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. Distribution of all irradiated gemstones that contain radioactive material now falls 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.

The three licensees currently approved to distribute irradiated gemstones are:

- HBM Virginia LLC, c/o HBM Nevada, LLC, 854 Beartooth Falls Court, Henderson, Nevada 89052; (702) 292-1701;
- Ideal Source Quality Assurance LLC, 1309 Overhill Court, Columbia, Missouri 65203; (573) 529-6820;
- International Isotopes Inc., 4137 Commerce Circle, Idaho Falls, Idaho 83401; (208) 524-5300.

NRC's presentation at the Tucson gemstone exhibition, Feb. 8, 2008, is [here](#).

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Frequently Asked Questions on Irradiated Gemstones

For consumers:

1. [Why and how are gemstones irradiated?](#)
2. [Does irradiation make the stones radioactive?](#)
3. [Is it dangerous to wear blue topaz?](#)
4. [Should I stop wearing blue topaz?](#)
5. [A jeweler told me it is now illegal to sell blue topaz because it causes cancer – is this true?](#)
6. [How can I tell if my jewelry has been irradiated?](#)
7. [Will I receive a radiation “dose” from wearing blue topaz or other irradiated gems?](#)

For Jewelers and Distributors:

8. [Why is NRC scaring industry and disrupting the sale of irradiated gemstones?](#)
9. [Do I need an NRC license to sell blue topaz or other irradiated gems?](#)

10. [Why is an “exempt distribution” license required for the initial distribution of irradiated gemstones?](#)
11. [Am I selling “contraband”?](#)
12. [Should I stop selling these popular gemstones?](#)
13. [I read that there was a ban on selling irradiated gemstones. Is this true?](#)
14. [Why do some irradiated gemstones fall under NRC’s authority, while others do not?](#)

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?

The NRC is not attempting to scare anyone nor disrupt any sales; we are merely attempting to ensure the proper handling of the gemstones. Early in 2007, 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 surveyed many 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 November 2007, the NRC issued three 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. Some 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?

All irradiated gemstones that are made radioactive now fall under NRC regulations. Before Nov. 30, 2007, gemstones irradiated in accelerators were not regulated by the NRC. However, the Energy Policy Act of 2005 gave NRC authority over radioactive materials produced in accelerators, and regulations implementing that authority took effect Nov. 30.

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.

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Exempt Distribution of Irradiated Gemstones

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Mission of the Nuclear Regulatory Commission

- Regulate the Nation's civilian use of byproduct, source, and special nuclear material
 - Ensure the adequate protection of public health and safety
 - Promote common defense and security
 - Protect the environment



Protection of Health and Safety

- Current situation – irradiated gemstones create an insignificant impact on public health and safety; small fraction of allowable public dose
- Non-compliance with NRC regulations is a violation of federal law, and can be enforced



What the Regulations Mean

- The initial distribution of gemstones to the public, after inducing radioactivity, must be done under an exempt distribution license
- All subsequent distributions do not require a license
- Should be able to verify that distribution was done under an exempt distribution license



NRC Regulations

- NRC regulations do not specifically address gemstones
- NRC regulations are generic for
 - Defining radioactive material requiring a license (10 CFR 20.1003)
 - Exemption from licensing to possess products containing radioactive material below a certain concentration (10 CFR 30.14)
 - Licensing the introduction of byproduct material in exempt concentrations into products or materials, and the transfer of ownership or possession of the product (10 CFR 32.11)
 - Recording and material transfer reports (10 CFR 32.12)



Definition of Byproduct Material

- Types of byproduct materials
 - Material made radioactive in a nuclear reactor
 - Material made radioactive in a particle accelerator, and produced, extracted, or converted after extraction, for use for a commercial, medical, or research activity



Persons Possessing Byproduct Material

- Persons can possess a product containing radioactive material without a license under certain conditions:
 - Product has radioactive material concentrations not exceeding 10 CFR 30.70 levels, and
 - Product was manufactured and distributed by someone with a license



Making a Product with Byproduct Material

- Authorizes the introduction of byproduct material into a product or material owned by a licensee, and the transfer of ownership or possession of the product to another that does not have or need a licensee
- Several conditions must be met to allow the transfer from a licensee to a non-licensee



Making a Product with Byproduct Material (con't)

- Licensee who is distributing the product must provide to the NRC
 - Description and intent of product
 - Method of introduction of radioactive material
 - Initial concentration of radioactive material
 - Control methods to assure concentrations
 - Time between introduction and transfer
 - Estimated concentration at time of transfer



Making a Product with Byproduct Material (con't)

- Licensee distributing the product is to provide
 - Reasonable assurance that concentrations do not exceed concentrations allowed for possession by an unlicensed persons
 - Use of lower concentrations not feasible
 - Assurance that product or material not likely to be incorporated in a product designed for application to a human being



Making a Product with Byproduct Material (con't)

- Exempt Distribution Licensee annual reporting requirements:
 - Type and quantity of product into which radioactive material is introduced
 - Type and quantity of radioactive material introduced into product
 - Initial concentration of radioactive material in the product at the time of transfer



What NRC Regulations Mean for Gemstones with Byproduct Material

- For irradiated gemstones containing byproduct material to be transferred to an individual not requiring a license, must be distributed under an exempt distribution license;
- Once the gemstones containing byproduct material are distributed under an exempt distribution license, there is no further NRC regulatory control over the gemstones (unless radioactive material is introduced again, after the exempt distribution)



How Gemstones Can be Imported

- Irradiated gemstones containing radioactive material may be imported, under the following conditions:
 - Do not import irradiated gemstones unless you have a proper license; or
 - You know that the irradiated gemstones have been released under an NRC exempt distribution license of another distributor/importer
 - If gemstones were previously released/distributed under the terms of a valid NRC exempt distribution license, they do not need any further regulatory control, and a license is not needed for import.



Guidance to Obtain a License to Distribute Gemstones Containing Radioactive Material

- NUREG-1556, Volume 8, “Program Specific Guidance About Exempt Distribution Licenses”

<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1556/v8/>

- Fact Sheet on Irradiated Gemstones on NRC website

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/irradiated-gemstones.html>

- Call or email staff at NRC Headquarters



NRC Future Steps

- Continue license application reviews
- Issue a Regulatory Issue Summary
 - A signed communication that expands on or clarifies an existing regulation
 - Placed on NRC website www.nrc.gov
 - Disseminate via professional organizations
- Perform inspections and surveys at licensee facility
- Rulemaking



U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

About NRC	Nuclear Reactors	Nuclear Materials	Radioactive Waste	Nuclear Security	Public Meetings & Involvement
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NRC holds the last of 3 public meetings, facilitated by Lance Rakovan, on security requirements for transporting certain radioactive material considered potentially of interest to terrorists. [more](#)

News Releases and Speeches

Key Topics

- [Emergency Preparedness](#)
- [Irradiated Gemstones](#)
- [Naturally-Occurring and Accelerator-Produced Radioactive Material \(NARM\) Toolbox](#)
- [New Reactor Licensing](#)
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- [Reactor License Renewal](#)

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