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Thoriated Tungsten Electrodes

INTRODUCTION

Thoriated tungsten electrodes contain thorium, a radioactive material that can pose health and environmental risks at elevated exposure levels. The use of these electrodes is exempt from Nuclear Regulatory Commission (NRC) regulations.

Effective August 27, 2014, electrode manufacturers and importers will need to possess a specific NRC license to distribute these electrodes. The license will impose requirements for labeling, quality control, reporting, and record keeping.

All persons shipping thoriated tungsten electrodes in the United States need to comply with Department of Transportation (DOT) regulations. DOT requires the thoriated tungsten electrodes to be properly packaged and labeled. The surface of the package must be monitored for radioactivity. For example, the US Postal Service requires the following label on the address side of the package:

> "This package conforms to the conditions and limitations specified in 49 CFR 173.426 for radioactive material, excepted package–articles manufactured from natural uranium (or natural thorium), UN2909 and is within Postal Service activity limits for mailing."

NATURE OF THE HAZARD

Thorium is a low-level radioactive material that primarily emits alpha particles as well as some beta and gamma radiation. These electrodes are normally sharpened by grinding as part of the standard procedure while preparing to perform gas tungsten arc welding (GTAW). Dust particles from this grinding process can cause internal radiation exposure if the dust is accidentally ingested or inhaled, so precaution is necessary. Concern regarding radiation exposure to the external body from these electrodes is minimal.

The risk of internal exposure during welding is negligible in most circumstances since the thoriated electrode is consumed at a very slow rate.

During the grinding of the thoriated tungsten electrodes, radioactive dust is created, posing the potential hazard of internal radiation exposure by inhalation or ingestion unless care is taken to control the dust.

HOW TO REDUCE EXPOSURE

- Choose thorium-free tungsten electrodes such as those containing cerium, lanthanum, yttrium, or zirconium.

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- Read, understand, and follow all information in the Safety Data Sheet (SDS) for the selected tungsten electrode.

- Use a high-efficiency dust collection system to capture particles created during the grinding of electrodes or disturbed during housekeeping.

- Evaluate the ventilation system before acceptance and periodically thereafter to minimize personnel and environmental contamination.

- Develop and implement standard operating procedures for the use of thoriated tungsten electrodes, including proper procedures for storage, grinding, use, housekeeping and disposal.

- Provide training in the operation of the welding and grinding equipment, personal hygiene, and safety.

WHAT TO DO WITH THE COLLECTED DUST PARTICLES

- Regularly remove the dust generated by grinding.

- Properly dispose of the dust and spent electrodes in accordance with federal, state, and local regulations.

SUMMARY

Several of the information sources listed indicate that the risk of occupational exposure to radiation during storage, handling, and welding with thoriated tungsten electrodes is negligible where simple precautions are taken. Special care should be taken to control and collect dust from grinding these electrodes in order to prevent a potential ingestion and inhalation exposure to radioactive dust particles resulting from this operation.

INFORMATION SOURCES

Nuclear Regulatory Commission (NRC). Code of Federal Regulations, Title 10 Energy, Part 40.13, available from the U.S. Government Printing Office, 732 North Capitol Street NW, Washington, DC 20401; telephone: 800-368-5642; web site: www.nrc.gov.

Department of Transportation (DOT), 49 Code of Federal Regulations, Title 49 Transportation, Part 173, available from the U.S. Government Printing Office, 732 North Capitol Street NW, Washington, DC 20401; telephone: 855-368-4200; web site: www.dot.gov.

United States Postal Service (USPS). Publication 52, Hazardous, Restricted, and Perishable Mail, Instruction 7A, Radioactive Materials, available from the USPS web site: www.usps.com.

Jankovic, J. T., W. S. Underwood, and G. M. Goodwin. 1999. Exposures from Thorium Contained in Thoriated Tungsten Electrodes. *American Industrial Hygiene Journal* 60: 384 – 389.

Oak Ridge National Laboratory (ORNL): Estimated Radiation Doses from Thorium and Daughters Contained in Thoriated Welding Electrodes, by L. M. McDowell-Boyer (ORNL/NUREG/TM-344). Oak Ridge, TN: ORNL, 1979.

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