



# Californium-252 Newsletter

*"To promote the exchange of information among <sup>252</sup>Cf users"*

July 2000

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## Successful San Diego ANS Sessions

Three technical sessions and a panel discussion on the industrial applications of <sup>252</sup>Cf neutron sources were held on June 6-7, 2000, at the summer meeting of the American Nuclear Society (ANS). Fifteen technical presentations [summaries available in the *Transactions of the ANS*, Vol. 82 (2000) 94S110] were made by the <sup>252</sup>Cf user community, with topics ranging from the use of <sup>252</sup>Cf to determine neutron irradiation hardness of solid-state detectors in the Large Hadron Collider under construction at CERN (J. Broadhurst and R. Rusack, p. 94) to small handheld contraband detectors based on neutron backscattering (see below). Attendance was good, averaging ~30 per session.

We learned that over \$100M of on-line coal and cement analyzers based on <sup>252</sup>Cf technology have been deployed, and that a \$600K effort in <sup>252</sup>Cf-induced criticality measurements saved the U.S. Department of Energy (DOE) \$20M in spent fuel packaging costs (J. K. Mattingly, J. T. Mihalcz, et al., pp. 95S96). For future reference, one summary tabulates elemental limits of detection (LODs) for a <sup>252</sup>Cf-based neutron activation analysis (NAA) system (p. 98), while another tabulates LODs for a prompt gamma NAA system (p. 102).

The panel discussion compared the relative merits of <sup>252</sup>Cf sources with those of accelerators and neutron generators. The importance of neutron source reliability and simplicity in commercial applications was emphasized by Michael Hurwitz of Gamma-Metrics, who also noted that use of neutron generators rather than <sup>252</sup>Cf sources in coal/cement analyzers would incur significantly higher costs. Concerns about the regulatory environment for radioactive sources were widely shared. For emergency monitoring situations, A. J. Caffrey of the Idaho National Engineering and Environmental Laboratory commented that unlike generators, <sup>252</sup>Cf sources cannot be transported on passenger airplanes.

Ed and Treva Janzow of Frontier Technology Corp. (FTC) provided a historical perspective to the first 30 years of <sup>252</sup>Cf source production and applications (p. 106). A more detailed manuscript is available upon

request from this editor or from FTC (contact information on next page).

*Thanks to Cathy Simmons of ORNL for her summary.*

## Technology Highlight: Contraband Detector

The Compact Integrated Narcotics Detection Instrument (CINDI) was developed by NOVA R&D, Inc., of Riverside, California, and presented at the San Diego sessions. This exciting development in handheld noninvasive detection of hydrogenous materials (or lack thereof) in concealed locations is an important commercial achievement in application of neutron backscattering and detection using low-intensity neutron sources. In-field detection of narcotics behind ship bulkheads and inside engine compartments and rolls of paper was reported [T. O. Tümer et al., *Trans. ANS*, Vol. 82 (2000) 96S97].

## Isotope News from ORNL

- Previously we reported concern with the international radioactive material transportation proposal to reduce the  $A_1$  value for <sup>252</sup>Cf by 50% (i.e., maximum Type A shipment of 2.5 mg rather than the current 5.0 mg). We are pleased to report that a proposed change to the next edition of the IAEA Transport Regulations has been initiated by ORNL staff and submitted via the DOE, which recommends reinstating the  $A_1$  equivalent of 5.04 mg based on radiobiological considerations. We will provide future updates.
- Heavy-element campaign 72 is scheduled to begin in mid-September 2000 with dissolution of the irradiated curium oxide target rods. The <sup>252</sup>Cf mass at campaign time is estimated at ~300 mg. Smaller masses of Bk, Es, and Fm isotopes will be available for approved research.
- Target rods for the next campaign (73) have been transferred to the High Flux Isotope Reactor (HFIR) to begin irradiation before HFIR's scheduled 6-month outage in late 2000 to replace the beryllium reflector. Irradiation will continue after HFIR resumes operation, to ensure continuity of <sup>252</sup>Cf supply into 2002.

## Commercial <sup>252</sup>Cf Vendors

The DOE <sup>252</sup>Cf Sales/Loan Program is traditionally prevented from supplying <sup>252</sup>Cf sources for commercial applications. Commercial reencapsulators supply this market. Following is a partial listing of the vendors, in alphabetical order, and descriptions (in their own words) of the services they supply. Another good source of information on nuclear industry suppliers is the annual buyers' guide issue of *Nuclear News*, published by the American Nuclear Society (ANS). We provide this list as a convenience to <sup>252</sup>Cf users who want to explore all source supply and transportation options, and we do not endorse specific vendors.

**BNFL, Magnox**, operates from a nuclear-licensed site with extensive shielded facilities for the post-irradiation examination of steel specimens, nuclear fuel, etc. This also includes a contamination-free hot cell, where ~milligram quantities of <sup>252</sup>Cf can be handled and fabricated using remote handling and welding equipment.

BNFL, Magnox Generation  
Magnox Electric plc  
Berkeley Centre, Berkeley  
Gloucestershire, GL13 9PB  
United Kingdom  
Telephone: 44-1-453-812-353  
Fax: 44-1-453-813-602

**Frontier Technology Corporation** is a designer and manufacturer of superior-quality neutron sources and related products. Major product lines are <sup>252</sup>Cf and Sb-Be neutron sources, water-extended polyester (WEP) shielding, and Type A shipping containers for radioactive material shipment or storage. Usually, a standard Frontier <sup>252</sup>Cf source design or modification is all that is required to meet customer requirements. Where necessary, Frontier can create a new design, perform engineering analysis and/or prototype testing, obtain U.S. Nuclear Regulatory Commission licensing approval, and obtain Special Form Certification for the new design.

Frontier Technology Corporation  
Post Office Box 486  
1641 Burnett Drive  
Xenia, Ohio USA 45385  
Telephone: 937-376-5691  
Fax: 937-376-5692  
E-mail: treva@juno.com

**GE Vallecitos Nuclear Center (VNC)** has been a leading nuclear research facility since 1957, when it became the site of the first licensed nuclear-generating plant in the United States. Today, VNC ranks among the nation's largest privately financed nuclear research facilities. VNC provides a broad range of products and services for clients throughout the world in the aerospace, medical, and nuclear industries. These include the following: Radioactive Materials Laboratory post-irradiation examination services; industrial and medical isotope sources (<sup>252</sup>Cf and <sup>60</sup>Co), and <sup>133</sup>Xe ampoules; lease and sale of radioactive material transport containers; and neutron radiography services.

General Electric Nuclear Energy  
Vallecitos Nuclear Center  
Sunol, California USA 94586  
Telephone: 925-862-4567  
Fax: 925-862-4516  
E-mail: Erin.Heinlein@gene.ge.com

**Isotope Products Laboratories** manufactures:

1. <sup>252</sup>Cf fission foils, whereby the <sup>252</sup>Cf is electrodeposited on platinum or platinum-clad nickel foil. The source is covered with gold to prevent loss of <sup>252</sup>Cf by recoil. Activity range: 10 Bq to 1.85 MBq.
  2. <sup>252</sup>Cf neutron sources, with a range of capsules, including the Savannah River Model SR-CF-100, and <sup>252</sup>Cf masses ranging from 0.01 to 1.0  $\mu$ g.
- For other activities, please inquire.

Isotope Products Laboratories  
1800 N. Keystone Street  
Burbank, California USA 91504  
Telephone: 818-843-7000  
Fax: 818-953-9776  
Web: [www.isotopeproducts.com](http://www.isotopeproducts.com)

Contact: Dr. Warwick Thorpe  
Director, Industrial Sales  
Telephone extension 116  
E-mail: [wthorpe@isotopeproducts.com](mailto:wthorpe@isotopeproducts.com)

## November <sup>252</sup>Cf Technical Sessions

We expect two <sup>252</sup>Cf sessions at the ANS/European Nuclear Society International Meeting, November 12-17, 2000, in Washington, D.C. One session will emphasize general applications of <sup>252</sup>Cf (and other) neutron sources, while the second will highlight medical applications of <sup>252</sup>Cf. The session agenda will be listed in the October *Californium-252 Newsletter*.

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## For Further Information

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<sup>252</sup>Cf applications and the ORNL Californium User Facility for Neutron Science <http://www.ornl.gov/divisions/ctd/cuf.htm>