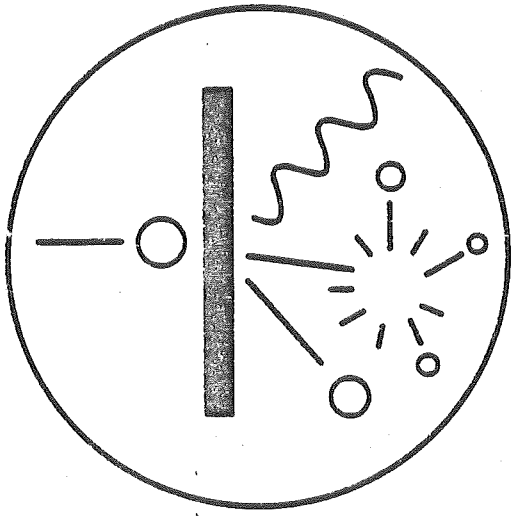
INTERNATIONAL NUCLEAR

TARGET DEVELOPMENT SOCIETY

NEWSLETTER



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International Nuclear Target Development Society
c/o Mrs. Joanne M. Heagney
Rt. 1, Box 72-B
USA - Eastsound, WA. 98245

The INTDS Newsletter is an informal source of information for and from the Membership.
The INTDS assumes no responsability for the statements and opinions advanced by the contributions.

Contents

Editorial

Dear Colleagues,

This second issue of the 1985 Newsletter will only reach you by the end of January 1986. We wanted to include the results of the election of the two new Board Members as well as the new 1985-86 membership-list, but this needed more time than we could foreseen. In this issue you will also find the minutes of the INTDS Board Meeting held at Oak Ridge on October, 4, 1985.

During this non-world conference year 1985 five INTDS board members were at the meeting of the Electromagnetic Isotope Enrichment Facility Users Group on October 5, so that they took that opportunity to held a board meeting on October 4. The actions and resolutions of this board meeting will be submitted to the membership during the 1986 Business Meeting in Chalk River.

I wish you and your families a Happy 1986 with good health and satisfaction in all your undertakings.

J. VAN AUDENHOVE
President

IN MEMORIAM - Marcel Weishaar

Marcel Weishaar died on October 18, 1985 at the age of 48.

He entered the "Centre de Recherches Nucléaires" at Strasbourg (France) in 1960 and was soon put in charge of target preparation.

Marcel died during a noontime swim that he and several colleagues were accustomed to take several times a week.

Our special thoughts go to his wife, two young children and his numerous friends both within and outside the scientific community.

INTDS BOARD MEETING
October 4, 1985
Oak Ridge, TN

The meeting was called to order at 9:12 a.m. Jan Van Audenhove, Harold Adair, Helmut Folger, Joanne Heagney and Bill Lozowski were in attendance. These five constituted a quorum of members of the Board.

Joanne Haegney gave the Secretary/Treasurer's report.

Jan Van Audenhove noted that the term of service for the vice-president, corresponding secretary/treasurer, and recording secretary should have been extended for one year and as was done with the term of the president and reported in the 1984 Minutes. The board agreed and extended the terms of the officers currently serving, for an additional year. This action will cause the election of the remaining officers of the INTDS to coincide with world meetings.

Other actions and resolutions:

1. The election to replace the board members with expired terms (Harold Adair, and Leo Sapir) will be conducted as developed for non-world conference years (1982 Business Meeting and reported in the December 1982 Newsletter). Joanne Heagney will convey the necessary mailings to the dues-paying INTDS members.

2. Helmut Folger, a member of the Electromagnetic Isotope Enrichment Facility Users Group Executive Committee, urged the INTDS to support the Users Group. Because the availability of isotopes is a vital concern of both organizations, the Board agreed to support the Group wholeheartedly.

   Jan Van Audenhove, current president of the INTDS and editor of the Newsletter, said that the next issue of the Newsletter will contain a poll to determine the isotope needs of the INTDS members. The results will be communicated to the EIEF Users Group.

3. A proposal to adopt bi-annual INTDS membership dues will be considered at the 1986 World Conference at Chalk River.

4. Joanne Heagney will try to have a rough draft of a policy manual (guide lines) for hosts of INTDS world conferences ready for distribution in time for the 1986 meeting. She explained: The task is a difficult one because many of the arrangements with former hosts have been necessarily unique and are likely to be so with future hosts.

5. No consensus of opinion emerged from a discussion concerning members with overdue membership fees.

6. As a result of a discussion concerning the desirability of broadening the membership base of the INTDS, Harold Adair and Jan Van Audenhove will invite selected material research groups to join the INTDS.

7. It is the opinion of the Board that the retiring (or leaving) members of the INTDS who have made significant contributions to the Society be given special awards.

8. The Board decided to retain the informal format of the Newsletter after a discussion which took notice of the fact that a more formal one would make the Newsletter widely publishable. It was the majority opinion that communication among the members is encouraged better if the contributions may be informal donations of information.

9. The 1986 World Conference was discussed with Joe Gallant and Peter Dmytrenko (both of Chalk River) during a conference call at 11:30 a.m. At the request of Joe and Peter, the Board will act as the Program Advisory Committee.

10. The next board meeting will be on September 16, 1986 at 9:00 a.m. in Chalk River or Pembroke.

The meeting was adjourned at 1:10 p.m.

Respectfully submitted,

Bill Lozowski

Bill Lozowski
Recording Secretary

BL:ep

13th WORLD CONFERENCE OF THE
INTERNATIONAL NUCLEAR TARGET DEVELOPMENT SOCIETY
SPONSORED BY THE CHALK RIVER NUCLEAR LABORATORIES
CHALK RIVER, ONTARIO, CANADA KOJ 1JO
SEPTEMBER 17 - 19, 1986

TELEX: 053 - 34555
TELEPHONE: 613 - 584 - 3311

CO-CHAIRMEN: J. L. GALLANT
P. DMYTRENKO

REQUEST FOR PAPERS

The 13th World Conference of the International Nuclear Target Development Society will be held at the Chalk River Nuclear Laboratories September 17 to 19, 1986. We are inviting you to present a paper at the conference.

The following is a list of information on conference content and manuscript presentation.

The abstract must be submitted no later than May 1, 1986.

The manuscript must reach the conference secretariat before or on September 17, 1986.

The Conference proceedings will be published in Nuclear Instruments and Methods in 1987.

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CONFERENCE CONTENT

The main topics of the conference will be as follows:

1. Preparation techniques and properties of

   - Targets in form of thin deposits
   - Self supporting targets
   - Samples for nuclear measurements in the form of pure metals, alloys, intermetallics, ceramics, compounds ...
   - Targets for medical radionuclide production
   - Thin substrate foils and stripper foils
   - Large area plastic film for use in detectors
   - Enriched isotopes ...

2. Preparation of radioactive sources for application in research and industry

   - The health physics aspect of radioactive source preparation ...

3. Assaying of materials for nuclear measurements by

   - Classical metrology, counting techniques, chemical analyses, isotopic analyses, activation analyses, radiography ...

4. Packing and conservation of targets

5. Need and availability of enriched isotopes for nuclear applications

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INFORMATION TO AUTHORS FOR ABSTRACT PRESENTATION

TITLE (All capitals)

Authors (Initials in capitals)

Institution (Initials in capitals)

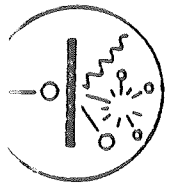
A B S T R A C T

Abstracts should be one typewritten page, contained within an area 155 mm x 230 mm. The title and by-line should be in the form indicated above. Since the abstracts will be direct-photocopy reproduced, typescripts need to be sharp and black on good white paper.

Corrections must be made with an opaque correction fluid or by pasting a clean white patch over the material to be deleted. Handwritten symbols, if used, should be neat, reasonably large, and in BLACK INK. The contribution to the proceedings should be prepared in the same manner.

Abstracts should be submitted until 1st of May, 1986

Mail abstracts to: Mrs. June Elliott
Nuclear Physics, Station 49
Chalk River Nuclear Laboratories
CHALK RIVER, Ontario
KOJ 1JO



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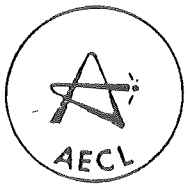

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INFORMATION TO AUTHORS FOR MANUSCRIPT PRESENTATION

This notice is coming to you early so that you will have ample time to prepare a paper that is ready for publication before you give your oral presentation at the meeting. The reason for this rule is to avoid a long delay before publication. The proceedings are to be published in Nuclear Instruments and Methods early 1987. Therefore, please follow their format and the guidelines listed below and bring your paper photocopy ready and in final form. All speakers who wish to present papers must present their written papers to the Organizing Committee before presenting their paper orally.

Before submitting your manuscript, please check the following points:

1. Is there an abstract in English? Is the manuscript in English?

2. Have you given the name(s) of the author(s) on the manuscript and the name and address of the institute where the research work was done? For the sake of correct indexing in abstracts' journals, etc., it is recommended that authors use full SURNAMES rather than just initials.

3. Is the manuscript clearly typewritten, with ample space between the lines, is the subdivision logical, and are the text and figures ready for printing? All dimensions should be stated in metric units. (The costs for making corrections are very high when proofs have been made of a manuscript. It will therefore be assumed that the submitted manuscript is in final form.)

   The subdivision should be (more or less) as follows:

   1. Introduction
   2. Experimental
   3. Results
   4. Conclusion

   References

4. Have you enclosed inked original drawings, or (preferably not) glossy prints of every figure, ready for direct reproduction? Are all details, especially the lettering and numbering, sufficiently large to show up clearly in the reduced size of the printed figure? (The consequence of making the slightest changes in the figures of the galley proof is that in most cases new blocks must be made). Your figure material will be returned to you after publication of the article.

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5. Is there a separate list of figure captions (All figures should have captions)?

6. Is the list of references complete, in accordance with the convention of Nuclear Instruments and Methods and all authors' initials given in all references?

7. Are 2 copies of the manuscript and 2 copies of its figures attached to the original manuscript?

8. Please check Nuclear Instruments and Methods, Vol. 167 and Vol. 200 for sample papers.

9. The manuscript must reach the Conference Secretariat on or before Sept. 17, 1986.

Conference Secretariat: Mrs. June Elliott
Chalk River Nuclear Laboratories
Nuclear Physics Branch
Chalk River, Ontario
KOJ 1JO

Materials Research, Development, and Production by the Isotope Production Department at the Oak Ridge National Laboratory*

Harold L. Adair, D. W. Ramey and W. S. Aaron

During the past few months, several very interesting target fabrication requests have been completed by the Materials Research, Development, and Production Groups at the Oak Ridge National Laboratory. Specifically, these have included ^{239}Pu and ^{233}U foils, high-energy gamma-ray sources, ^{248}Cm deposits, and ^{3}He implantation.

Plutonium-239 and ^{233}U foils were rolled to an areal density of 20 mg/cm^2. Plutonium-239 and ^{233}U fission chambers were then prepared from these materials by cutting eight pie-shaped segments of each isotope and epoxying the materials on the inside surface of the hemispherical chambers. After mounting the foils in the chambers, the foils were overcoated with 60- to 100-$\mu g/cm^2$ gold to retard oxidation.

During FY 1985 seven ^{244}Cm-^{13}C, high-energy, gamma-ray sources have been prepared. A monoenergetic, 6.130-MeV gamma ray is produced from the de-excitation of the second excited state of ^{16}O in the $^{13}C(\alpha,n)^{16}O$ reaction. The number of 6.130-MeV gammas produced is directly related to the amount of alpha emitter present (^{244}Cm in this case) and how homogeneously the ^{244}Cm and amorphous ^{13}C components are mixed. The 6.130-MeV gamma output and the neutron output from the $^{244}Cm(\alpha,n)^{16}O$ reaction for various amounts of ^{244}Cm as oxide mixed with 200 mg of amorphous ^{13}C are given in Table 1.

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*Research sponsored by the Division of Basic Energy Sciences and Division of Nuclear Sciences, U.S. Department of Energy, under contract DE-AC05-840R21400 with the Martin Marietta Energy Systems, Inc.

Table 1. The 6.130-MeV gamma output and neutron output

^{244}Cm Content (mg)	6.130-MeV Gamma Output (γ/s)	Neutron Output (n/s)
0.8	1740	4.6×10^4
1.6	3000	9.1×10^4
2.0	3945	1.1×10^5
2.3	4260	1.2×10^5
3.1	5280	1.7×10^5
4.0	8100	2.2×10^5

A small vacuum evaporation system has been installed in a hood enclosure and is being used for preparing thin actinide deposits on various substrate materials including thin carbon. Small, resistively heated cylindrical crucibles are used in the evaporation process.

Curium-248 targets for use in super-heavy element experiments at Darmstadt were the most recent targets prepared in this system.(1) The ^{248}Cm target fabrication involved converting the ^{248}Cm to $^{248}CmF_3$ according to a procedure developed by Lougheed and Hulet.(2) The $^{248}CmF_3$ was contained in a vitreous carbon crucible which was placed in a tantalum-resistant crucible. A 12-mm-I.D. quartz chimney was placed over the crucible to collect the ^{248}Cm that was not deposited on the 50- to 100-$\mu g/cm^2$ carbon substrate.

The evaporation was conducted by slowly heating the crucible to 1100 to 1200°C while maintaining vacuum in the low 10^{-5}-torr range. While the actual evaporation of the CmF_3 occurred quickly (approximately 5 min), the heating and cooling of the crucible were performed slowly to minimize thermal shock to the deposit and/or backing and to heat the backing by radiant heat in an effort to improve bonding of the deposit to the carbon foil. The target was

(1)Isotope News, Oak Ridge National Laboratory, No. 9, October 1, 1985.

(2)R. W. Lougheed and F. K. Hulet, Nuclear Instruments and Methods 66, 329 (1979).

then removed from the system and assayed by gross neutron counting. After a number of deposits had been made, the tantalum heater was exchanged for a carbon resistance evaporation apparatus in which a 3-mm-diam by 30-mm-long graphite rod was inserted into 2-mm-deep recesses in the two graphite electrodes. The carbon was heated rapidly, and power was maintained until the rod burned in two which yielded an approximately 10 $\mu g/cm^2$ overcoating of carbon on the targets.

Eleven $^{248}CmF_3$ targets were shipped to GSI, Darmstadt.

A capability has been established by the Oak Ridge National Laboratory for charging various materials by the "tritium-trick" process.(3) A number of research programs, including fusion research, involve exploring the effects of helium on various metallic specimens. In fusion research, for example, helium will induce degradation of mechanical properties and could well be the limiting factor in determining fusion reactor first-wall life.

The so-called "tritium trick" has the capability of injecting ^3He in engineering-size specimens at a relatively high rate. Tritium is soluble in all metals to varying degrees. The metal specimens to be charged with helium are allowed to absorb tritium at an elevated temperature. Specimen temperature is maintained while a certain fraction of the absorbed tritium (~0.5% per month) is decaying to ^3He. After the desired level of helium is achieved by the elapse of the proper tritium decay time, the remaining tritium is removed by a 16-h vacuum heat treatment, which leaves the relatively immobile ^3He deposited in the metal lattice. After the tritium removal step, the specimens are cooled to room temperature, removed from the vacuum system, and decontaminated. After decontamination, transferable tritium contamination of 4 disintegration per second per 100 cm^2 is the typical result of test smears.

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(3)Isotope News, Oak Ridge National Laboratory, No. 6, January 1, 1985.

The current tritium-trick system can produce a tritium equilibrium pressure up to 1 atm and a specimen temperature as high as 800°C for an extended period (two to three months). The ^{3}He charging rate is a function of the solubility of tritium in the metals to be tested. In our current work, several vanadium alloys have been subjected to the tritium-trick process. Helium-3 charging rates for these alloys have been as high as 550 atomic parts per million (appm) per month with an equilibrium pressure of 53 kPa at 400°C. Destructive analyses of these vanadium alloys have shown residual tritium levels in the range of 0.5 to 1.3 mCi/g of alloy. This low level of residual tritium will allow specimen testing in a well-ventilated contamination zone rather than in a hot cell.

The rapid helium injection offered by the tritium trick is a valuable tool in alloy development for fusion reactor applications. For example, the 550-appm level of helium charging for the vanadium alloys processed would normally take approximately 11 years to produce under actual 14-MeV neutron irradiation. The tritium trick also offers a convenient method for separating the helium effects from radiation damage effects. Finally, the size and shape of the test specimens and the very low residual tritium level are obvious advantages to routine metallurgical testing.

THIN TARGETS FOR HIGH RESOLUTION PROTON SPECTROSCOPY

J. Vanhoy and C. Westerfeldt

Duke University and Triangle Universities Nuclear Laboratory*

Durham, North Carolina, USA 27706

The KN Van de Graaff at TUNL is exclusively dedicated to providing high energy-resolution (~350 eV) proton beams from 0.7 to 4.1 MeV [1]. The beam is primarily used to perform spectroscopic studies on odd-mass 2s-1d and even mass 1f-2p shell nuclei [2,3]. We are also in the initial stages of an attempt to investigate target effects on the shape of narrow (p,γ) resonances. Time independent resolution contributions include the rf ion-source energy spread, straggling in the target, and doppler broadening.

Recent target nuclei have included: ^{29}Si, ^{27}Al, ^{39}K, ^{33}S, ^{23}Na, and ^{35}Cl. Compounds containing these nuclei are evaporated onto 2 - 5 $\mu g/cm^2$ self-supporting carbon foils obtained commercially.

Thin targets of 0.8 - 1.3 $\mu g/cm^2$ of silicon were produced by evaporating 95.2% enriched $^{29}SiO_2$ onto 2 $\mu g/cm^2$ foils coated with collodion. The evaporation utilized a closed Ta boat with Ta powder as a reducing agent. An electron gun method was also attempted but appeared to give greater oxygen contamination [4].

Previous experiments on potassium utilized potassium iodide for evaporation. Potassium iodide was unsatisfactory in our experiments because very low beam currents (on the order of several hundred nanoamperes) were required to prevent target decay.

*Work supported by the U.S. Department of Energy, Office of High Energy and Nuclear Physics, under Contract No. DE-AC05-76ER01067.

Potassium carbonate (mp 891°C) was obtained from Oak Ridge National Laboratory enriched to 99.97% in ^{39}K. Targets capable of withstanding 2 μA of 1 - 3 MeV protons were produced by evaporating the isotope onto gold coated carbon foils. The ~ 1 μg/cm² gold layer served several purposes. The gold allowed thicker targets (~ 1 - 2 μg/cm²) to be made. Since scattering from gold at our energies is purely coulomb, targets can be monitored for deterioration and decay. It is also probable that the gold layer conducts heat away from the target spot and extends the target lifetimes (and possibly reduces the doppler broadening contribution to the resolution limit).

The standard target for sodium experiments in the past has been sodium chloride. This compound was unsuitable for our experiments due to the large number of reaction channels in both ^{23}Na and ^{35}Cl, which produced many nearly overlapping peaks in the detector spectra. Sodium trititanate (mp 1128°C) was the compound of choice. After evaporation, very little titanium was found on the targets. The residue in the Ta boat resembled that obtained earlier with titanium dioxide. Although the precise compound formed on the target is unknown, these targets proved stable with beam intensities of 1 - 3 μA for over a day without significant deterioration.

Work on a high resolution experiment requiring high enrichment ^{33}S has been suspended for the past year. Some surviving cadmium sulfide targets were located from an experiment completed 10 years ago. These few targets provided preliminary data, even though they severely deteriorated in any beam current. We have beem unable to locate a source of either elemental ^{33}S or $Cd^{33}S$ which has been sufficiently enriched (80 - 90%) for our needs. Elemental sulfur is the form of choice since many targets can be made with a minimal amount (< 1 mg) by the Ag_2S procedure [5,6]. Oak Ridge National Laboratory and Alfred Hempel GMBH and Co. in West Germany are

unable to supply the material presently and have no plans to produce any in the future. Only low enrichment (~ 25%) ^{33}S is availible. Any information regarding sources of high enrichment ^{33}S would be greatly appreciated.

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[5] Nooren, and Van der Leun, Nucl. Phys. A423 (1984) 197.

[6] Streurenburg, van Middlekoop, et al., Nucl. Phys. A306 (1978) 157.

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PEOPLE'S REPUBLIC OF CHINA

Xu Guoji, Guan Shouren, Luo Xinghua and Meng Xiangjin

Activity Report 1985

Cold rolling

^{63}CuO has been reduced to Cu at 600° C in a H_2 stream for 30 minutes and molten afterwards in a carbon boat by resistive heating. It has been rolled down to 1 mg/cm^2. ^{107}Ag powder has been molten in a carbon crucible and then rolled to 2 mg/cm^2

Other targets made with cold rolling were Ni, Ta, Nb, Ti, Pt, Y and Al-Zr.

Vacuum evaporation

Targets produced during the past year by vacuum evaporation in thickness from a few μg/cm^2 to several mg/cm^2 were as follows : ^{24}Mg, ^{116}Sn, CaF_2, LiF, MoO_3, Au, Al, Ag, Cu, Pd, Pb, Y and Ge.

About 800 Au flims on VYNS were prepared and approximately 500 carbon foils were fabricated for targets or target backings.

Heavy ion sputtering

For experiments at the IAE HI-13 tandem accelerator lanthanide targets in the oxide form will be needed, therefore some tests have been made with heavy ion sputtering. Before sputtering rare earth oxide powder was pelletized to a 10 mm diameter disc and heated at 450° C for 30 minutes. The beam stop to substrate distance was 2 cm and the substrates were Al and Cu foil of 20 μm. The result was listed in the following table. From the table it could be seen that the value of the yield was little smaller that that of metal of 28 μg/cm^2/mg.

element	Cathod material mg	Sputtered material mg	Target thickness $\mu g/cm^2$	Yield $\mu g/cm^2$ mg
Nd_2O_3	213.58	19.01	471.3	24.8
Nd_2O_3	171.21	18.70	299.8	16.0
Gd_2O_3	326.55	20.37	456.0	22.4
Gd_2O_3	573.13	16.90	337.0	19.9
Er_2O_3	544.34	19.49	484.1	24.8
Er_2O_3	924.33	16.88	382.2	22.6
Sm_2O_3	264.60	16.20	483.0	29.8
Sm_2O_3	302.18	11.30	327.3	29.0
Yb_2O_3	751.63	21.05	596.1	28.3
Yb_2O_3	512.34	25.85	759.2	29.4
Eu_2O_3	341.75	15.05	396.3	26.3
Eu_2O_3	381.67	15.70	458.2	29.2
Dy_2O_3	412.67	15.10	408.6	27.1
Dy_2O_3	527.31	20.01	568.4	28.4
Lu_2O_3	512.83	8.25	215.2	26.1
Lu_2O_3	427.18	13.23	368.3	27.8
CeO_2	967.81	10.12	281.7	27.8
CeO_2	706.35	5.08	138.4	27.2

A High Vacuum Portable Exsiccator

R.Pengo,L.Ziomi
INFN-Laboratori Nazionali di Legnaro
I-35020, LEGNARO (Padova,Italy)

It is often necessary to transport from one laboratory to another, thin films under vacuum, made of of materials which are chemically very reactive.One example is the use of nuclear targets, very often expensive, which are produced in certain locations and employed somewhere else, sometimes overseas.Thus it is indispensable to use containers which are able to maintain a vacuum inside which is better than 10^{-3} mbar and for relatively long periods.At our laboratory a stainless steel container has been constructed of about 1 liter capacity which is able to keep a vacuum better than 2×10^{-5} mbar for more than 3 weeks.

The device is shown in Fig.1.The pumping system is made of a strip of getter material *), wound in a spiral, and mounted on a standard CF 100 flange. A vacuum tight feedthrough for high current and a standard flange DN 25 for pumping are mounted on it. The use of a CF 100 flange gives a high flexibility of usage: it can in fact be mounted on any vacuum system due to its very small dimension.It is for instance compatible with the cryogenic exsiccator installed at the Target Laboratory of LNL [1] .

The device operates in the following way.Once the materials are inside, the container is closed using a copper ring.Using the feedthrough a maximal current of 30 A flows through the strip (maximal power ca. 70 W) from a common transformer.One end of the strip is shorted on the flange which is at ground potential.At the same time the container is evacuated through the DN 25 flange, the vacuum being better than 1×10^{-3} mbar.The previous operation needs around 50 minutes: during that time the 80 cm long strip does not exceeed a temperature of 320 ^{0}C while the exterior does not exceed 60 -70 ^{0}C.In order to protect the samples from heat radiation, they are shadowed by a metallic reflecting sheet, so that their temperature is around 120 ^{0}C during regeneration .They come back to room temperature in about three hours.

The strip is guarantied to be non evaporable [2], and in any case the samples are protected by the metallic sheet from direct contamination.We also performed a X-Ray Fluorescence analysis by means of a scanning electron microscope on a sample of gadolinium, looking for trace of the getter components: iron, zirconium and vanadium.The spectrum shown in Fig.2 does not include any of these elements.

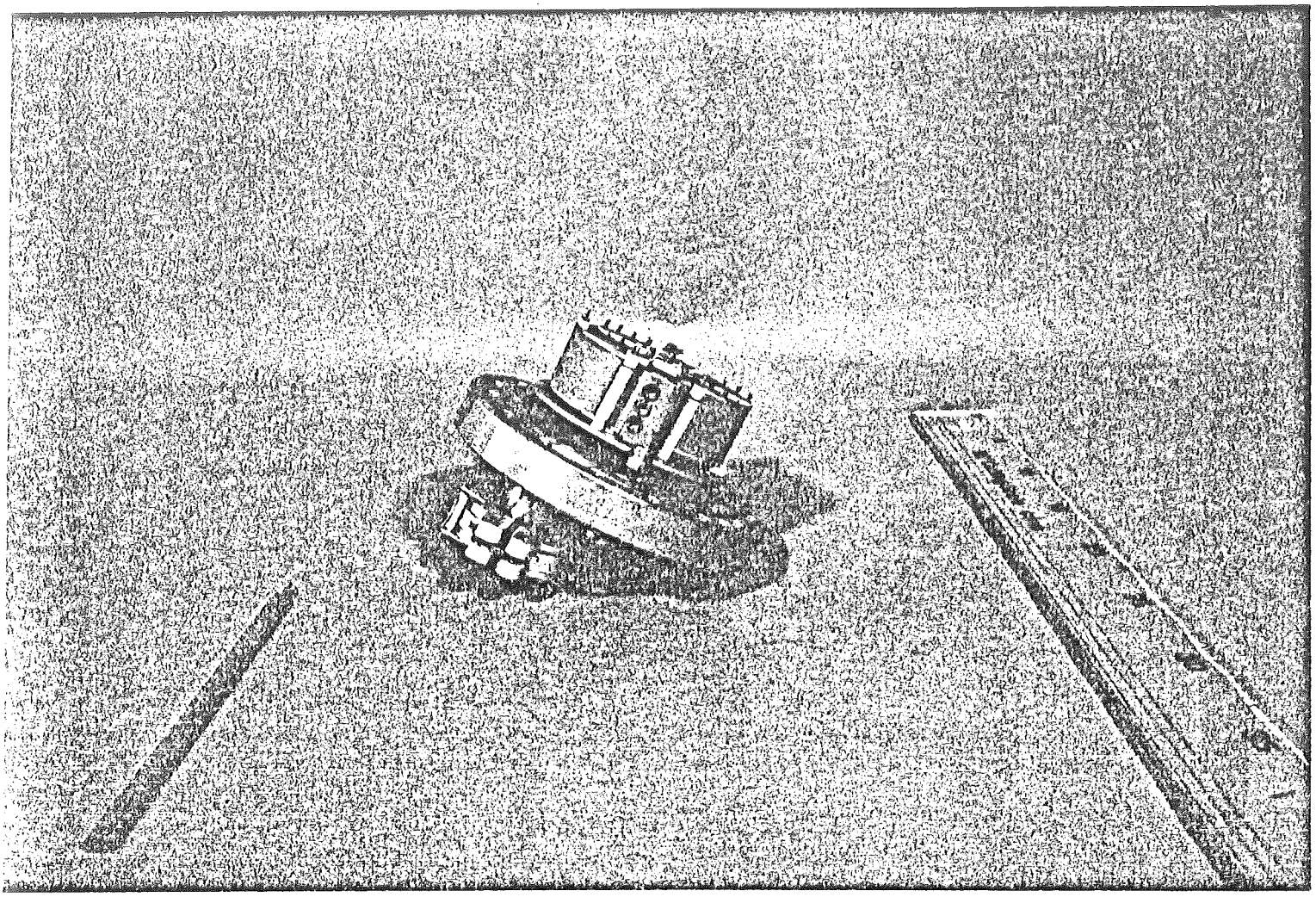
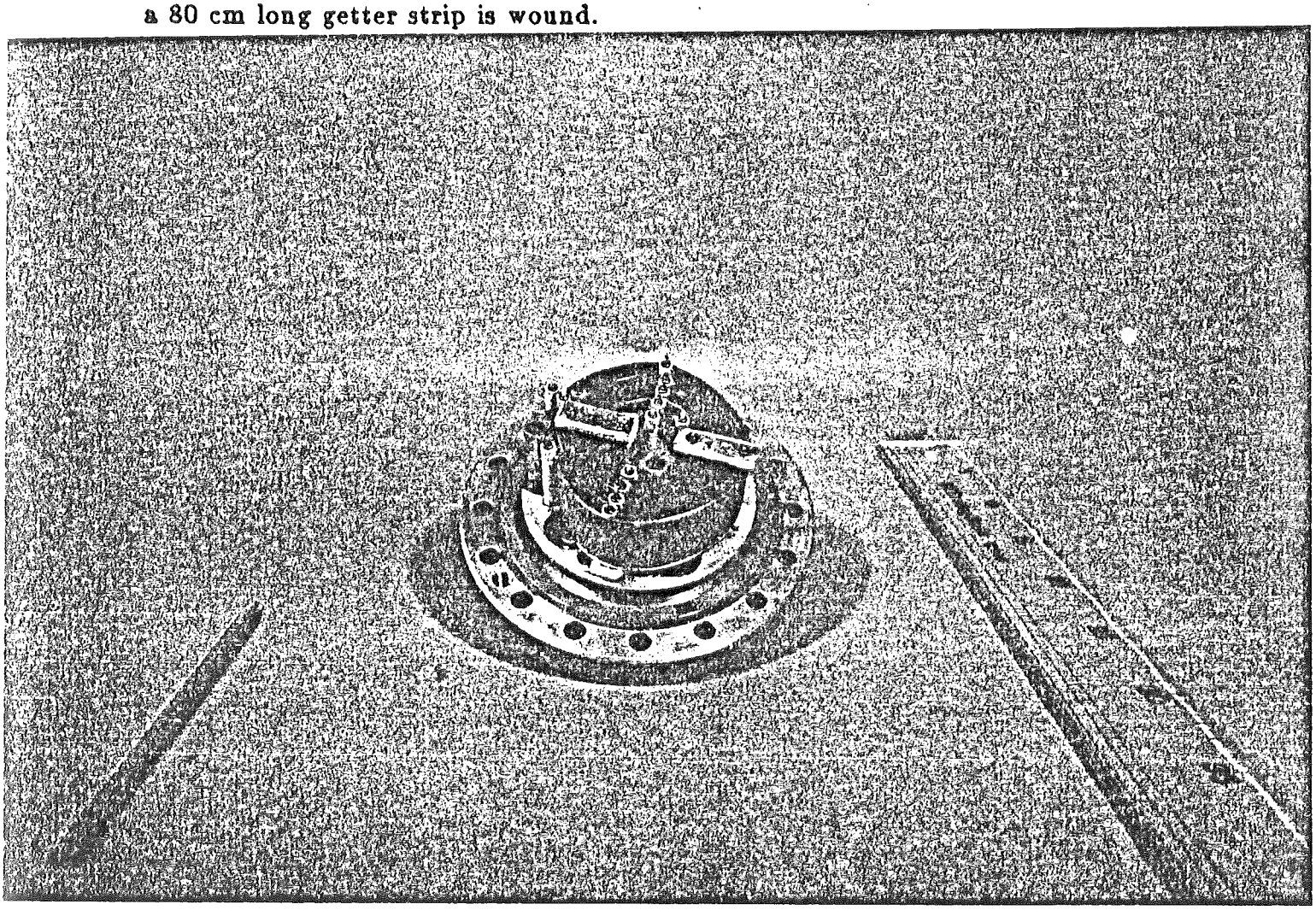


Fig.1 - Photograph of the device.It consists of a CF 100 flange on top of which a 80 cm long getter strip is wound.



After 50 minutes, the current is stopped and the external pumping continues for 10 minutes more.Than the all system is isolated.From this moment on the value of the vacuum is shown in Fig.3.In it is clearly seen that, after an initial increase in pressure, the vacuum becomes better until the pump starts slowly to saturate and the pressure increases.The process happens in long (three-four weeks) time intervalls compared to the goal of the apparatus.

The device described is at the same time flexible and inexpensive, the cost of 1 meter strip being less than 40 US dollars and it can be regenerated more than 15 times. The flexibility comes from the use of standard CF 100 flange and the very little space needed.

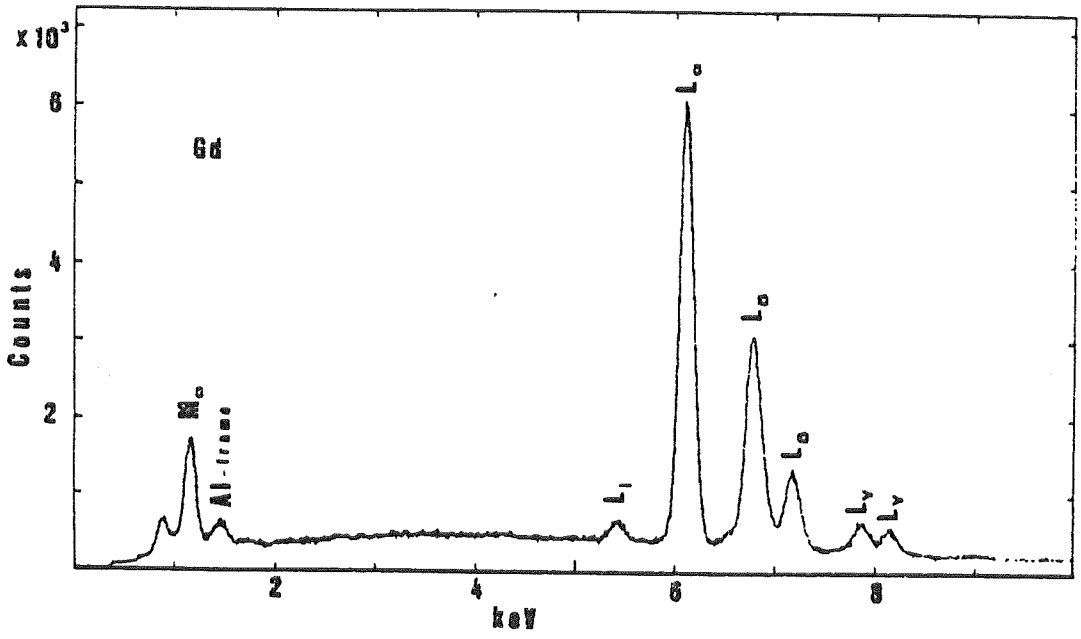


Fig.2 - Spectrum of X-Ray Fluorescence obtained with a SEM , referring to a sample of gadolinium target.

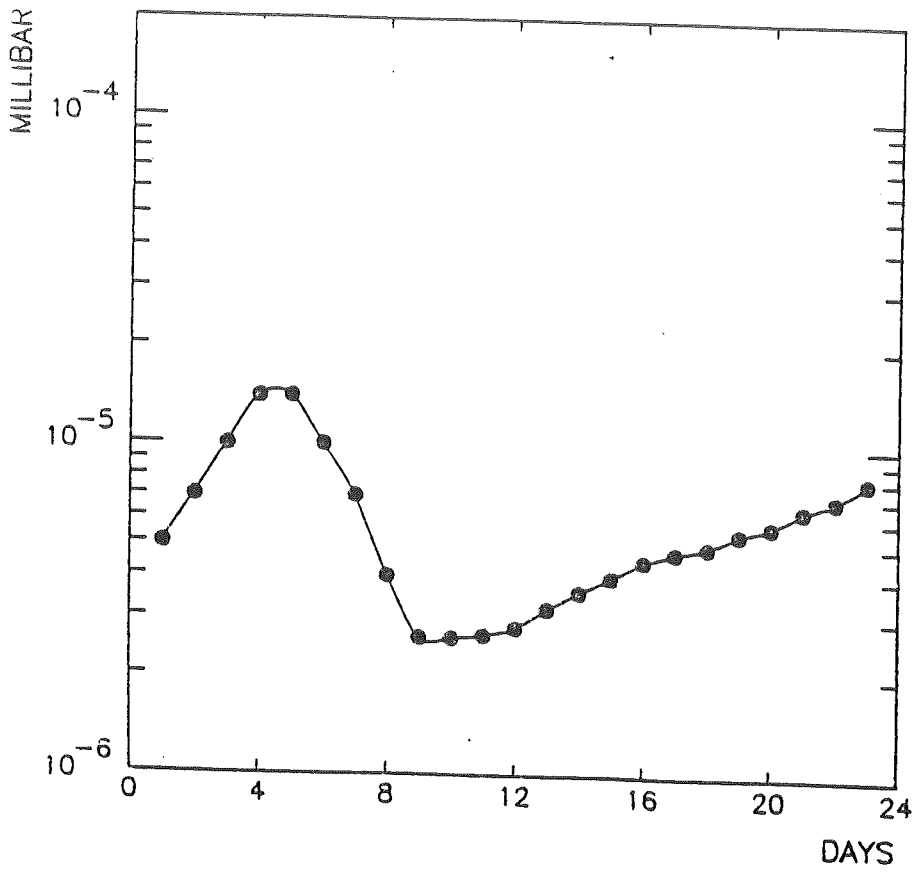


Fig.3 - Plot of the pressure inside the container as a function of the time, when no external pumping was connected nor current was flowing through the getter strip.

References:

*) SAES GETTER,Milan (Italy)

1) R.Pengo, to be published

2) B.Ferrario,A.Figini and M.Borghi,VACUUM 35(1984)13.

Borosilicate Glass Foils

Scott M. Hitchcock

The Arizona Carbon Foil, Co., Inc.
750 N. Stone Avenue
Tucson, AZ 85705

and

John O. Stoner, Jr.

Physics Department, Bldg. #81
The University of Arizona
Tucson, AZ 85721

We found it necessary to devise a strong pinhole-free foil window having thickness of one micrometer or less, capable of withstanding a pressure difference of 10 kPa at a diameter of 3mm and temperature of 300 °C, and containing no measurable carbon.

Pyrex 7740 (Corning TM) borosilicate glass satisfied all of these requirements. We produced foils by heating one end of a 3mm diameter tube in a gas-oxygen flame until the tube softened and closed. When we withdrew the tube quickly and blew hard on the open end, the closed end formed a glass bubble that exploded into a cluster of thin-sheet fragments. We tested the thicknessess of those that were sufficiently large and flat to serve as windows.

Good candidates showed colored interference fringes under white-light illumination. To estimate their thickness we focused the tungsten filament of an incandescent lamp onto each window and viewed the reflected light nearly normal to the surface with a small spectroscope. The easiest features to identify were narrow dark bands across the spectrum indicating destructive interference between the light reflected from the front and back surfaces. The number of these increased as the foil thickness increased.

Calibration spectra were provided by Hg spectral lines in conventional mercury-vapor fluorescent lighting; the two spectra could be superimposed or viewed individually. The five lines used were at 436nm, 503nm, 546nm, 577nm and 579nm. These allowed us to set up a dispersion curve for the spectroscope and discriminate between different foil thicknesses. Using in addition a table of expected wave lengths for destructive interference for different thicknesses (see below), we could estimate the thickness in favorable cases to about + 20%.

Foils showing no more than two such bands were less than about 700nm thick.

Our preliminary tests showed that such a foil, when cemented over a hole having 3mm diameter, will often support one atmospheric pressure differential.

Calculated Wavelengths for Destructive Interference

Refractive Index = 1.5

FOIL THICKNESS (nm)	VISIBLE WAVELENGTHS (nm)
100	None
200	600 (Red)
300	450 (Blue)
400	600 (Red), 400 (Blue)
500	500 (Green)
600	600 (Red), 450 (Blue)
700	700 (Red), 525 (Green), 420 (Violet)
800	600 (Red), 480 (Blue), 400 (Violet)
900	675 (Red), 540 (Green), 450 (Blue)

Suppliers of Materials for Target Makers

Mrs. Edith B. Fehr (Yale University, A.W. Wright Nucl. Struct. Lab., P.O. Box 666, 272 Whitney Av. New Haven, Connect. 06511) send a list of suppliers of materials as needed by target makers. She believes that this list is heavily weighed in favor of local and US firms and by no means complete.

We believe this is a very useful initiative and we hope that as suggested by Edith you will add your own sources so that we can prepare a world wide list for materials and services for publication f.e. in the Newsletter.

TARGET FABRICATORS

Oak Ridge National Laboratory Isotope Division, ORNL, P.O. Box X, Oak Ridge, Tennessee, 37830. Howard Adair, Telephone: 615-474-5900. ORNL will furnish a complete range of targets.
They will also furnish certain masspectrometer implanted targets.

Micromatter Company, Rte. 1 Box 72B, Eastsound, Washington 98245, Joan Heagney, Telephone: 206-376-4007, will furnish a fairly complete range of targets.

Microfoils, P.O. Box 283, Argonne, Illinois 60439, Frank Karasek, Telephone: 312-246-4015, (rolled targets).

Cambridge Isotope Laboratories, Inc. 141 Magazine St., Cambridge, Massachusetts 02139, Telephone: 617-547-1818. Isotope labelled thin films of C,H,N,O isotopes

CARBON FOILS

Atomic Energy of Canada, Limited, P.O. Box 6300, Station J, Ottawa, Canada, Telephone: 613-592-2790. ^{12}C and ^{13}C and Beam Stripper foils (plastic support).

Arizona Carbon Foil Company, 4152 East 6th Street, Tucson, Arizona, 85711, Telephone: 602-323-2028 or 881-0169. Carbon foils on glass slides.

Penn Spectra Tech. Incorporation, 411 Bickmore Drive, Wallingford, Pennsylvania, Telephone: 215-874-7006, ^{12}C and ^{12}C targets. Also furnishes carbon films on glass slides. Lasclo Czihas, University of Pennsylvania, Telephone: 215-243-5964.

Yissum Research and Development Company, P.O. Box 24100, Jerusalem, Israel, Telephone: 882200, Carbon Foils on glass slides.

SEPARATED ISOTOPE SUPPLIERS

Union Carbide Corporation
Oak Ridge National Laboratory, Isotope products and services
P.O. Box X Oak Ridge, Tennessee 37830
Telephone: 615-574-6984
T.E. Ratledge

Monsanto Research Corporation
Mound Laboratory, P.O. Box 32, Miamisburg, Ohio 45325
Telephone: 513-865-3501/02
Vivian O'Brien
Best source for gases (^{3}He, Neon, Argon, Krypton, Xenon, Oxygen, Nitrogen). Also Sulfur, Chlorine, Bromine, Carbon isotopes.

Research Products Division, Miles Laboratories, Inc.
Research Division, Elkhart, Indiana
Telephone: 219-164-8804
Deuterium, Oxygen and Nitrogen and compounds.

Bio-Rad Laboratories
32nd and Griffin Avenue, Richmond, California 94804
Telephone: 415-234-4130
Deuterium, Oxygen, Nitrogen, ^{13}C

Kolan Trading Co., Inc. (Russian)
540 Madison Avenue, New York, New York 10022
Telephone: 212-751-8844

Isotec, Inc.
7542 McEwen Rd., Centerville, Ohio 45459
Telephone: 513-435-4669
(Gases, also Cd, Fe, Sn as metal)

Cambridge Isotope Laboratories, Inc.
141 Magazine Street, Cambridge, Mass. 02139
Telephone: 617-517-1818

^{12}C, ^{13}C, ^{2}H, ^{15}N, ^{18}O etc.

YEDA Research and Dev. Co., Ltd.
P.O. Box 95, Rehovot, Israel
Telephone: 054-70617 - 054-83240
Oxygen isotopes

Alfa Products Division
Thiokol/Ventron
152 Andover Street, Danvers, Mass. 01923
Telephone: 617-777-1970
Deuterium compounds

Israel Atomic Energy Commission
Nuclear Research Center
Yavne 70600, Israel

THIN FOILS

Goodfellow Metals
Cambridge Science Park
Milton Road, Cambridge, (B4 4D), England

Atomergic Chemetals Corp.
100 Fairchild Avenue, Plainview, New York 11803
Telephone: 516-822-8800

Chromium Company of America
8701 Union Avenue, Cleveland, Ohio
Telephone: 216-271-4910
(nickel and copper)

Union Carbide Corporation
Bound Brook, New Jersey
(parylene)

Lebow Company
38 Gerald Place
Goleta, California 93017
Telephone: 805-964-7117

A.D. Mackay Inc.
98 Broadway
New York, New York 10038

Alpha Products (Thiokol-Ventron)
152 Andover Street
Danvers, Massachusetts 01923
Telephone: 617-777-1970

Luxel Corporation
P.O. Box 6175
Santa Barbara, California 93111
(mostly filters)

Electronic Space Products (ESPI)
854 Robertson Blvd., Los Angeles, California 90035
Telephone: 213-657-5540 - 1-800-638-2581

Microfoils
P.O. Box 282
Argonne, Illinois 60439
Home Telephone: 312-246-4015
custom rollers

Reactor Experiment Inc.
963 Terminal Way
San Carlos, California 94070
Telephone: 415-592-3355

SOURCE HEATERS AND BOATS

R.D. Mathis Company
2840 Gundry Avenue, Long Beach, California 90806
Telephone: 213-246-7049

Sylvania Electric Products, Incorporated
Portsmouth Avenue, Exeter, New Hampshire 03833
Telephone: 603-722-4331

Materials Research Corporation
Orangeburg, New York 0962
Telephone: 914-359-4200

MATERIAL SUPPLIERS

Alfa Products (Ventron Corporation)
P.O. Box 159, Beverly, Massachusetts 01905
Telephone: 617-922-0768
Most efficient for telephone orders - will generally ship by United Parcel overnight.

EM Laboratories, Unc. (Affiliate of E. Merck, Germany)
500 Executive Boulevard, Elmsford, New York 10523
Telephone: 914-592-4660

Materials Research Corporation
Orangeburg, New York 10962
Telephone: 941-359-4200

Balzer Coating Materials (Distributed by R.D. Mathis Company)
2840 Grundy Avenue, Long Beach, California 90806
Telephone: 213-425-7049

Hazelden Company
P.O. Box 1436, San Jose, California 95109
Telephone: 408-225-1747
(Rods for Ion Source Fabricated Ceramics)

JOB OPPORTUNITY *

Wanted: Target Maker
Rutgers University
Department of Physics and Astronomy
P.O. Box 849
Piscataway, NJ 08854

JOB DESCRIPTION

Duties: Prepare ion source materials and targets from natural and isotopic elements and develop new techniques when required. Perform some characterization of materials. Coordinate well with nuclear physicists on new methods. Prepare stripper foils, keeping abreast of state-of-the-art. Maintain the target lab's equipment, chemical stock, target storage facility.

Requirements: 2-3 years practical experience. A degree in Material Science would be a plus.

Salary commensurate with experience.

Contact Prof. N. Koller.

* This job opportunity is indicated by Dan Riel, for additional information get in touch with him :
Nuclear Structure Laboratory
State University of New York
Stony Brook, New York 11794 - 3800, USA

Tel. : (516) 246 - 6700
Van de Graaff (516) 246 - 7110

New Board Members

The two members who received the most votes by written ballot and who agreed to serve as directors for three-year terms to the INTDS board are :

Peter Dmytrenko, Chalk River, Canada
Peter Maier-Komor, Techn. Univ. Munich, F.R. Germany

Congratulations to both !
Of the 77 ballots mailed, 46 were returned.

We want to thank those members who participated in the election process for their cooperation and last but not least Joanne M. Heagney for organising this vote.

The current Board members, their respective tenures and the current officers are as follows :

Peter Dmytrenko, Canada	to 1988
Helmut Folger, F.R. Germany	to 1986
Hans Maier, F.R. Germany	to 1986
Peter Maier-Komor, F.R. Germany	to 1988
Dan Riel, USA	to 1986
Jean Pauwels, EEC	to 1987
Geir Sletten, Denmark	to 1987

Officers :

President :	Jan Van Audenhove, EEC	to 1986
Vice-President :	Harold Adair, USA (President Elect)	to 1986
Corresponding Secretary-Treasurer :	Joanne Heagney, USA	
Recording Secretary :	Bill Lozowski, USA	

Depletion of the Inventory of Enriched Isotopes

Due to limited funding only eight calutrons were operated at Oak Ridge National Laboratory during 1985 compared to sixteen in previous years.

The production planned for the next three years based on expected funding will be less that 25 % of that needed to maintain inventory equilibrium. The number of unavailable isotopes is expected to increase to 105 by 1988.
A number of isotopes predicted to be not available in 1988 is given in Fig. 1.

A group of concerned individuals from worldwide research communities was formed in 1984. In 1986 this "Electromagnetic Isotope Enrichment Facility (EIEF) Users Group" will be chaired by D. Keith Evans (Chalk River, Canada). Our INTDS Board Member : Helmut Folger (G.S.I., Darmstadt, FRG) is a member of the Executive Committee of this Group. The availability of isotopes is of vital importance for nuclear measurements and analytical work and I therefore ask you and all users of your establishment to support the efforts of the EIEF Users Group by expressing concerns as well as by indicating actual and future needs for separated isotopes.

You can use the form given in appendix to the Newsletter.

J. VAN AUDENHOVE