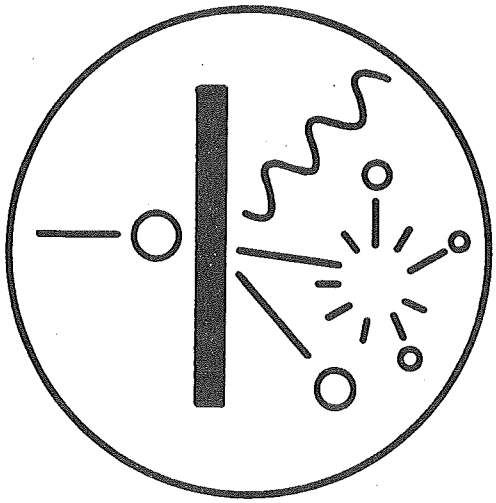
INTERNATIONAL NUCLEAR

TARGET DEVELOPMENT SOCIETY

NEWSLETTER



FEBRUARY 1980

I N T D S Newsletter

February 1980

The Newsletter is distributed at least twice a year. It is intended to be an informal method of communicating information.

We would encourage all members to make contributions. The following items could be of interest

1. Description of recent work.
2. Information on any newly developed techniques or progress made.
3. Request for advice on, for example
   - making specific targets,
   - obtaining specific material (e.a. enriched isotopes).

Our thanks are due to the Direction of the Central Bureau for Nuclear Measurements for their support and encouragement in producing the Newsletter.

Editor

Jan VAN AUDENHOVE
Central Bureau for Nuclear Measurements
B - 2440 GEEL (Belgium)

Assembled and typed by :

Edith De Coninck

FROM THE DESK OF THE PRESIDENT

The Society takes this opportunity to thank Jozef Jaklovsky and New England Nuclear Corporation for their extensive efforts as hosts for the recent World Conference of INTDS in Boston (1979). It was a superb Conference and certainly well attended. Presently Jozef is editing the "Proceedings" of the Conference which will be published and distributed to conferees and members in the near future.

By now all members and associates of INTDS should have received the first announcement of the 1980 World Conference to be held in Gatlinburg, Tennessee, U.S.A. Although specific dates have not as yet been selected, the Conference will be held during the week of October 12, 1980. When I receive responses from persons interested in presenting papers at the Conference, then specific dates can be designated based on the number of papers submitted. I hope to see all of you at the Conference.

The Society is pleased to announce that Dave Tolfree has been very active in organizing the "Carbon Foil Steering Committee" of INTDS as was discussed and agreed upon at the Conference in Boston. To this end, Dave would like to announce the real existence of this important Committee and to solicit additional committee membership and technical contributions for review, evaluation, and distribution to Society carbon foil users. Thus far, committee membership includes the following persons:

J. Gallant	AECL, Canada
R. Auble	ORNL, U.S.A.
S. Baskin	Arizona State University, U.S.A.
P. Maier-Komor	Technical University of Munich, Germany
I. Sugai	Tokyo University, Japan
T. Hattari	Tokyo University, Japan
P. Dan Hartog	ANL, U.S.A.
G. Thomas	ANL, U.S.A.
J. Van Audenhove	B.C.M.N., Geel, Belgium

In support of the important work on carbon films throughout the world and to disseminate pertinent information in carbon foil preparative developments, a special half-day session of presentations and discussions will be held as a part of the upcoming Conference in October. Dave Tolfree will chair this session and will be responsible for its format. The Society is truly honored to have such a leader as Dave in its membership. Please contact Dave directly for further committee information: Daresbury Laboratory, Science Research Council, Daresbury, Warrington WA4 4AD, U.K. (Telephone: Warrington 65000 Ext. Telex: 629609). However, please send abstracts (300 words or less) of contributed papers for the Carbon Foil Symposium to me before June 1, 1980, so that I can have them included in the Conference program.

Shortly, I will be sending to all members and registered associates our plans to revamp our Constitution so that the periods of service for officers and directors can be modified to improve coordination of Society management from year to year. Such change in our Constitution requires a vote of the membership and therefore I request that you all carefully review our plans and submit any suggestions to me for further modifications. The vote will be held at the Conference in October. By now you should have received a copy of our Constitution from Joanne Heagney, Treasurer.

SEE YOU IN GATLINBURG

E.H. KOBISK

World Conference of the

International Nuclear Target Development Society

Boston, 1 - 3 October 1979

The conference was attended by slightly more than 70 participants (USA : 51 ; Canada : 5 ; Denmark : 1 ; C.E.C (Belgium) : 2 ; Israel : 1 ; the Netherlands : 1 ; Italy : 1 ; Switzerland : 1 ; Saudi Arabia : 1 ; Japan : 1 ; W. Germany : 4 ; United Kingdom : 3).

24 papers were presented.

We should like to thank Jozef JAKLOWSKY, New England Nuclear and all the people who worked so hard to make this meeting a succes.

Minutes of the Business Meeting

of the International Nuclear Target Development Society, Inc.

Held on October 3, 1979

The meeting was called to order by the President, Dan Riel. As the "first order of pleasure," Dan led the membership in a hearty round of applause for NEN, Jozef Jaklovsky and colleagues for orchestrating such a splendid conference.

As the first order of business, Dan told the membership that Ed Kobisk of Oak Ridge National Laboratory had volunteered to host the next meeting approximately the second week in October, 1980, in Gatlinburg, TN. Dan then suggested that the Society establish and maintain a five-year list of future INTDS conference sites. Such a list took form as Leo Sapir of the Weizmann Inst., Israel, offered to host in '81 and Dave Tolfree of Daresbury Lab., England, offered for '84. Declared in open discussion: these sites and dates are in keeping with a long-established desire of the Society to shift the site of the conference in a manner which will allow the greatest number to attend and yet (as much as possible) avoid a continual travel burden on anyone.

A resolution was proposed and passed that all papers to be published in future INTDS Conference Proceedings must be submitted within thirty days after the corresponding conference.

Joanne Heagney, Secretary-Treasurer, reported that we have eighty members, approximately sixty of which are active.

In accordance with the By-Laws of the Society, the following seven people were elected by the membership present to constitute the board of directors: Jan Van Audenhove, Joe Gallant, Joanne Heagney, Ed Kobisk, Hans Maier, Dan Riel, George Thomas.

The meeting convened for lunch during which the board met and filled the following offices:

President - Ed Kobisk
Vice President - Jan Van Audenhove
Corresponding Secretary and Treasurer - Joanne Heagney
Recording Secretary - Bill Lozowski

The office of Recording Secretary was created to partially relieve an over-burdened Secretary-Treasurer.

Ed Kobisk presided over the last minutes of the meeting and told the group that he and Dave Tolfree would be in communication concerning the organization of a swift information exchange for those of us pursuing the development of better carbon stripper foils for heavy ion accelerators.

Jan Van Audenhove graciously volunteered to edit the newsletter.

Respectfully Submitted,

Bill Lozowski

Bill Lozowski
Recording Secretary

CARBON FOIL COMMITTEE

D.W.L. TOLFREE
Daresbury Laboratory
Science Research Council
UK - Darasbury, Warrington WA4 4AD

I have been asked to set up a steering committee under the auspices of the INTDS from people who have an interest in the development of long lived carbon foils for use as ion beam strippers, exciters for beam foil spectroscopy and as nuclear target backings. It is envisaged that the members of the committee will be workers actively engaged in the field.

The purpose of the committee will be to coordinate the work being done, to ensure that all important aspects are covered, and that wasteful duplication is avoided. The topics to be covered will include:

1. Standardisation of methods of preparation and testing.
2. Establishment of unambiguous nomenclature.
3. Investigation of the basic structure of foils in relation to their applications.

It is intended that the steering committee will represent a wide range of interests in different fields and laboratories. Below are listed the names of people who have so far agreed to work on the committee and it is hoped to add further names in the near future. If anybody with interest in carbon foils would like to participate please contact me as soon as possible.

Members

D.W.L. Tolfree (Chairman)	Daresbury Laboratory, England
N.R.S. Tait	Daresbury Laboratory, England
J.L. Gallant	Chalk River Laboratory, Canada
I. Sugai	Institute for Nuclear Study, University of Tokyo, Japan
T. Hattari	Institute for Nuclear Study, University of Tokyo, Japan
S. Hashkin	University of Arizona, USA
J. Stoner	University of Arizona, USA
P. Maier-Komor	Technische Universität München, W. Germany
G.E. Thomas	Argonne Laboratory, ANL, USA
P. Den Hartog	Argonne Laboratory, ANL, USA
J. Pauwels	Central Bureau for Nuclear Measurements, Geel, Belgium
J. Van Audenhove	Central Bureau for Nuclear Measurements, Geel, Belgium
R. Auble	Oak Ridge National Laboratory, USA

Carbon Stripper Foil Development Work at Daresbury Laboratory

D.W.L. TOLFREE

A review of development work being carried out on carbon stripper foils was made at the Boston Conference in October. It was stated that lifetime measurements would be carried out on ethylene-cracked foils prepared on heated substrates. These were tested using a 1.2 MeV Ar beam on our Harwell test facility and although only a small number were measured no significant improvement in lifetime of thin (5-10 $\mu gm/cm^2$) heated foils over thin unheated foils was observed. These foils were prepared on rock salt substrates heated up to temperatures of $300^{o}C$. It is clear that further work has to be done perhaps at higher temperatures before any firm conclusions can be drawn. The improvements in lifetime of heated standard foils is much more significant (ref. NIM 158 1979, 333). This may be due to the differences in the shrinkage behaviour of the two types of foils under irradiation. A number of 'slackened' thin ethylene foils were also tested and improvements $\sim$3 in lifetime over thin foils and $\sim$ 30 over 'standard' foils were obtained.

Most of the work is now being concentrated on analysing the structure of the ethylene foils and relating this to the irradiation characteristics. Extensive examinations using electron microscopy, infra red spectroscopy and mass spectroscopy are being carried out.

It is satisfying that a number of different groups principly at Chalk River and Oak Ridge are now successfully preparing foils and obtaining similar lifetime results to us. Obviously more work needs to be done and it is hoped that a collaborative effort between interested groups would be mutually beneficial.

Lifetime of graphitized carbon foils under fast ion irradiation

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West Germany

We have tested our previous statement[1] that the lifetime of amorphous carbon foils will be enhanced if their structure is transformed into a graphitic one prior to irradiation. We performed the following experiments:

(i) Simultanously to the ion irradiation foils of (5...8) $\mu g/cm^2$ surface density were heated to about 1000 K by means of a CO_2-laser. The lifetimes were increased by a factor 2.

(ii) Before exposing the foils to the ion beam they were graphitized at a temperature of about 1700 K (during 1 h) by means of a CO_2-laser. The lifetime of these specimen under ion irradiation was found to be about 6 times the lifetime of virgin (amorphous) foils irradiated in the same way (200 keV $^4He^+$, 0.6 $\mu A/mm^2$). The electron diffraction pattern of these foils show that they have a graphite structure.

This means that the increase of lifetime is more likely due to graphitization[2] than to annealing[3].

1) J. de Physique (Paris) 40, C1-301 (1979)
2) Rad. Eff. 40, 143 (1979)
3) Nuc. Instr. Meth. 98, 379 (1972)

Target Preparation Laboratory
Nuclear Physics
Chalk River Nuclear Laboratory
Chalk River, Ontario, Canada, K0J 1J0

J.L. GALLANT

Since the Boston conference some work has been done on the thickness measurement of cracked ethylene carbon films.

The thickness cannot be determined reliably by the ethylene gas volume in function of time as there are too many variables. One promising method is the measuring by piezoelectric effect, where the natural frequency of a quartz crystal is compared with the crystal change due to the carbon deposition. This is done by laying the crystal in the deposition area and reading the change of frequency after the cracking.

Results will be released through the I.N.T.D.S. carbon film development steering committee.

A method is developed for the fabrication of thin, deuterated polyethylene leak-proof target holders that produces the minimum possible γ-ray yield for neutron capture γ-ray studies.

This method should appear shortly as a letter to Nuclear Instruments and Methods.

HIGH-PURITY METALLIC LEAD-208 ☆

E. Newman

Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830, USA

It has been suggested at past meetings of the INTDS that metal samples be routinely made available from the ORNL Isotope Enrichment Program. We have recently concluded a separation for the production of very-high-isotopic-assay ^{208}Pb and have attempted to honor the suggestion by preparing the product as lead metal. The material now available from the separations program has an assay of 99.970% and has been prepackaged in 250-mg quantities in sealed glass ampules. This material is equal to, or better than, any of the isotopic enrichments of lead which have been available from the program previously. The metal is in the form of small, random-sized beads which can be melted and rolled or evaporated to prepare targets or beam stops. The isotopic assay is as follows:

Isotope	Assay (at.%)
204	<0.001
206	0.004
207	0.026
208	99.970

*Research sponsored by the Office of Basic Energy Sciences, U. S. Department of Energy under contract W-7405-eng-26 with the Union Carbide Corporation.

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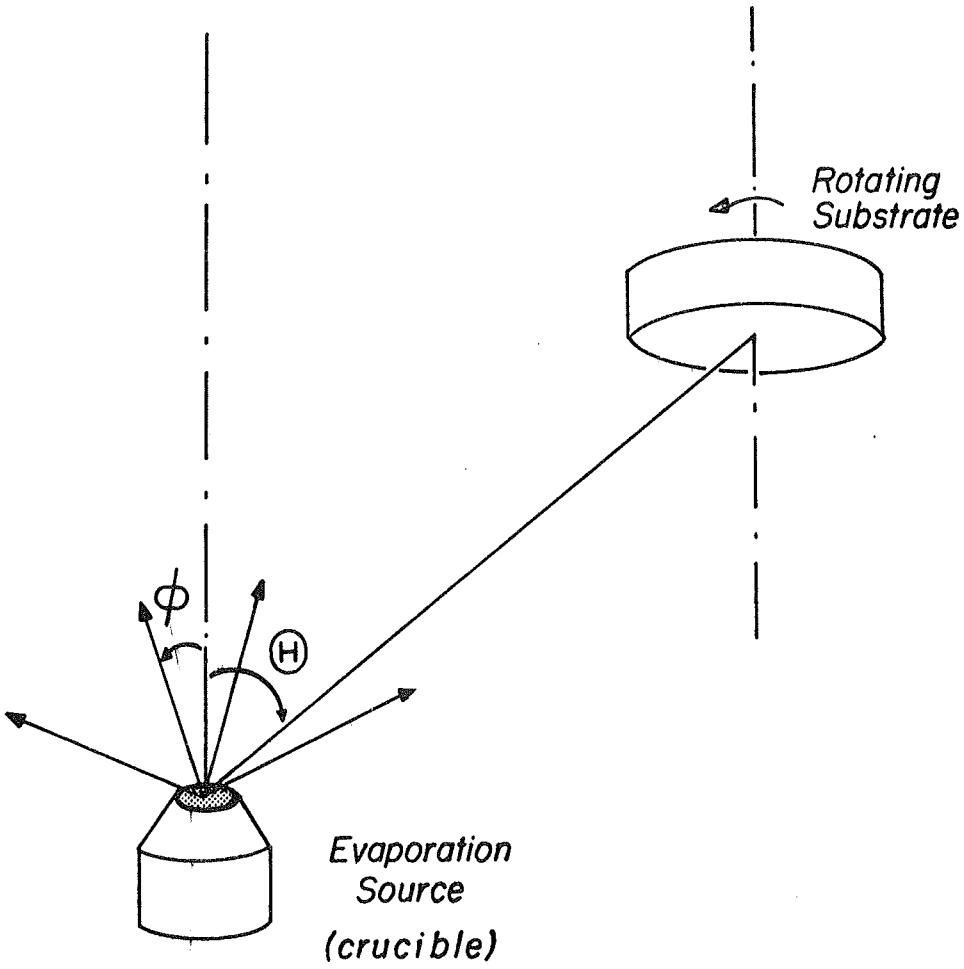

Figure 1

TELLURIUM TARGETS

Andrée MEENS
CENTRE DE RECHERCHES NUCLEAIRES
LABORATOIRE P.N.P.A.
67037 STRASBOURG CEDEX
FRANCE

The following describes our experience concerning Te targets.

Self-supporting Te targets were prepared from 60 $\mu g/cm^2$ to 1 mg/cm^2 by evaporating Te onto a glass slide coverd with Teepol. Nevertheless a 1 mg/cm^2 self-supporting Te target is very brittle and it is preferable to evaporate the Te onto a collodion film.

If the Te has to be evaporated onto a Pb backing, it will react with the Pb,and a good target cannot be made. It is better to prepare PbTe beforehand by reacting stoichoimetric amounts of Pb and Te in a quartz vessel. This vessel must be sealed under vacuum and heated at 1000°C for 24h. The PbTe product could be evaporated without any problem onto thin Pb foils.

Self-supporting targets of PbTe, which presents a higher melting point than pure Te, were prepared by using a soluble Cu substrate.

K.O. Zell, A. Dewald, A. Geuer
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Zülpicher Str.77, D-5000 Köln 41, West Germany

Preparation of Zn and Ge Plunger-Targets

For Lifetime measurements by the recoil distance dopplershift method (plunger) we needed very even Zn and Ge (0.5 mg/cm^2) targets on gold foil (2mg/cm^2) with no uneveness (points, wrinkles) greater than 0.1 μm in an area of at least 15mm diameter when stretched.

The gold foils were prepared by evaporating it directly onto carefully cleaned dust free glassplates and floating the foil on water afterwards. No release agent was used.

The Ge (15mg) was evaporated out of a carbon tube (fig.1) which was heated by electron bombardment similar to the method of Westgaard[1] onto a gold foil sticked to the plunger ring and cooled by a small copper block which was directly laid on the foil and stretched it by its wheight (17g).

The ZnO (25mg) was mixed with 6mg C and carefully grinded in an agate mortar. It is essential to press the material to a tablet (diameter 3mm) to avoid sputtering during the evaporation out of a closed Ta-crucible (fig.2). The gold backing was still on the glass plate which was cooled by a copper block sticked to it by silicon paste. Great care has to be taken that the crucible is without the smallest trace of grease which goes to the gold and prevents the Zn condensing there. The evaporation has to be done very slowly (some minutes) and can be monitored by the pressure encrease caused by the CO_2.

Other activities were rolling of Mo, Pd (the original supplied powder was melted by a Leybold electron gun) and Nd (prepared from Nd_2O_3 by reduction with Th (Ref. 1)) foils of 1-4 mg/cm^2.

[1] L. Westgaard, S. Bjornholm: Nucl. Instr. Meth. 42 (1966) 77

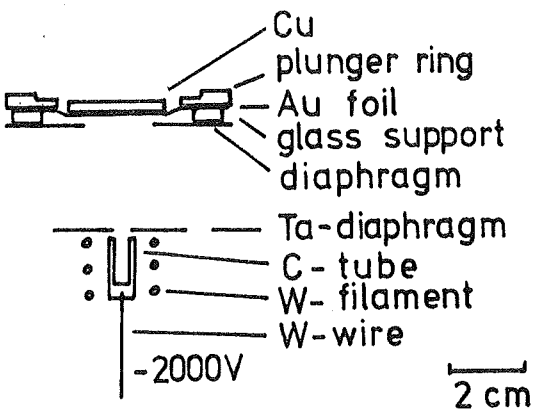

Fig. 1

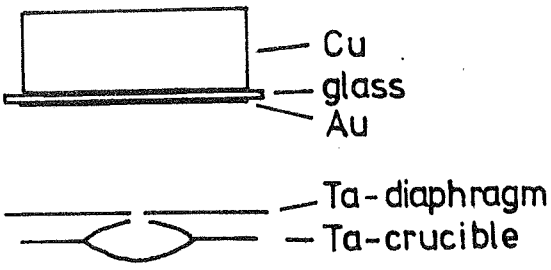

Fig. 2

GEORGE E. THOMAS

PHYSICS DIVISION

ARGONNE NATIONAL LABORATORY

9700 S. CASS AVENUE

ARGONNE, ILLINOIS 60439, USA

Have developed a method for routinely producing self supporting B targets. Will publish a short note on the method.

Some interesting targets:

Continue to produce double sandwich targets for heavy ion experiments;

^{120,122,124}Sn (500 μg) + Au (250 μg) + Pb (75 mg).

Standards produced:

10, 25, and 50 mono-layers of V on 50 μg/cm^2 Al.

Construction will begin shortly on our multi-target evaporation system. Another evaporation system and a tubular furnace are being purchased.

Experiments now usually demand higher purity targets than in the past. As a result, we have performed experiments to determine the optimum evaporation parameters to produce the purest targets.

TARGET LABORATORY

J. PFEIFFER
G. RIEPE
Institut für Kernphysik
Kernforschungsanlage Jülich
Postfach 1913
D - 5170 JÜLICH

For various experiments at the cyclotron (IKP and visiting groups), at the research reactor, and in university laboratories about 200 targets (with and without backing) were prepared from 30 different elements (from 64 different enriched isotopes) by the following techniques: vacuum deposition, rolling (after reduction or melting) pressing and sedimentation. The thicknesses were ranging from 30 $\mu g/cm^2$ to 9 mg/cm^2, and the areas were between 50 and 400 mm^2.

A.H.F. MUGGLETON

DEPARTMENT OF NUCLEAR PHYSICS

RESEARCH SCHOOL OF PHYSICAL SCIENCES

THE AUSTRALIAN NATIONAL UNIVERSITY

CANBERRA, A.C.T. 2600

AUSTRALIA.

Brief notes on target laboratory activities. Jan. - Oct. 1979

1. An alpha gauge for measuring target thickness by alpha absorption has been designed and constructed. This apparatus will accommodate six nuclear targets or alternatively can be used to check the resolution of up to six silicon surface barrier detectors per loading.

2. Carbon stripper foils have been produced by cracking an Ethylene/ Argon mixture and are currently being evaluated in the mid-terminal stripper of our 14UD Van de Graaff accelerator. Their lifetime is being compared with that of foils produced by the carbon-arc technique. Preliminary results are disappointing.

3. Wrok is well advanced in constructing a heavy-ion sputtering facility using a modified duoplasmatron ion source. It is anticipated that this apparatus, when completed, will considerably extend the work that can be undertaken. e.g. sputtering of refractory materials, foil thinning and surface etching of targets.

4. Considerable effort has been expended in producing $^{198,200,204}HgS$ targets. Targets 10-200$\mu g/cm^2$ on carbon backings and 2mg/cm^2 on thin silver backings have been produced. Silver was chosen as a backing material due to its high thermal conductivity, thus effectively dissipating the heat generated in the target by the accelerator beam.

The following targets have been produced during this period:-

Al, Au - 100 µg/cm^2 self supporting

^{138}Ba ^{209}Bi - 150 µg/cm^2 on thin carbon backings

^{140}Ce - 100 µg/cm^2 on thin carbon backings

^{164,166,167,168,170}Er, ^{154}Gd, ^{150}Nd - 0.5 to 5.0 mg/cm^2 self supporting

^{144,148,150,154}Sm, ^{141}Pr, ^{142}Nd, ^{174}Yb, 100 µg/cm^2 on thin carbon backings

^{130}Te, ^{124}Sn - 400 µg/cm^2 self supporting

^{198,200,204}HgS - 100 µg/cm^2 on thin carbon, 2 mg/cm^2 on thin silver

^{206,207,208}PbS - 100 µg/cm^2 on thin carbon backings

^{24,26}Mg, WO_3 - 100 µg/cm^2 on thin carbon backings

^{98,100}Mo - 150 µg/cm^2 on thin carbon backings

KI, Fe, Cu, Ge, Se, Cr - 10 µg/cm^2 on thin carbon backings

^{203,205}Tl - 10 mg/cm^2 self supporting

^{28}SiO, Si - 200 µg/cm^2 self supporting