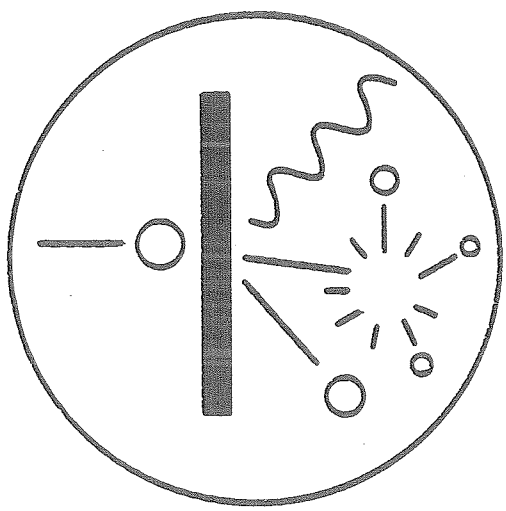
INTERNATIONAL NUCLEAR TARGET DEVELOPMENT SOCIETY

NEWSLETTER



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Editors Note

Dear Colleagues,

There are a few points arising from the last INTDS Board meeting that are worth a special mention:

- There are a number of conferences coming up in 1992 that may interest INTDS members (see calendar of events), particularly the "Application of Accelerators" conference in Denton, Texas, for which a session on target preparation is planned, and the "Electrostatic Accelerators" conference at Padova. If you think you can make a suitable contribution at one of these events this would be very helpful in promoting the work of the target-maker.

- The INTDS has updated its guidelines for financial support for speakers at INTDS conferences (see page 6). Applications for support for the 1992 INTDS conference should be received by 21 March.

- The biennial membership fee for INTDS is still only $ 50. This includes Newsletters and conference proceedings for all members. This is tremendous value!

You will find a new compilation of INTDS conference and Newsletter publications enclosed. This is the work of Piotr Robouch and Christophe Louvrier. We hope you find it useful.

Finally, please can you check your address at the back of this Newsletter. There are many missing telephone numbers and almost no fax or E-mail numbers. If you can find a minute or two to send me this information I would be grateful.

Chris Ingelbrecht
EDITOR

Retirement of Albert Muggleton

On occasion of his retirement at the end of 1991 I would like to appreciate Albert Muggleton's remarkable work concerning nuclear target research and development.

Albert is one of the very few pioneers of accelerator target technology, who worked far back in the early days of nuclear physics research. From 1957 to 1968, he was the head of the special techniques group preparing nuclear targets, fission foils and semiconductor detectors for the department of nuclear physics of the A.W.R.E. at Aldermaston, Berkshire, England. Since 1974 until today he is responsible for the development and preparation of nuclear targets in the department of nuclear physics at the Australian National University in Canberra.

Albert's contributions to the field of nuclear targetry are characterized by diversity, inventiveness and creativeness. His numerous published papers have been a rich source of information for many young students and target makers. They include fundamental work on isotopically enriched boron, carbon and oxygen targets, on single crystal gold and silver targets, as well as instrumental developments like a special type of crystal oscillator film thickness monitor or a saddlefield ion beam sputter source.

Besides a Master's Degree of Science (MSc.) in physics from the Australian National University, Albert holds two National Electrical Engeneering Certificates. His varied professional life comprises, in addition to targetry, leading positions of many years' standing in two notable british private companies, where he was involved in the development and product management of special vacuum tubes and semiconductor detectors.

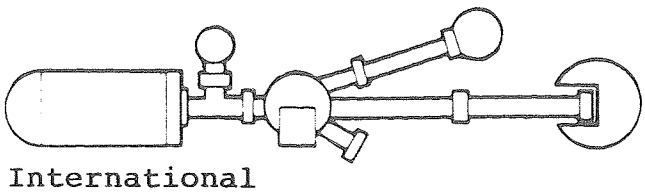
Albert joined the INTDS in 1974. On behalf of the whole INTDS community I wish him all the best for the future. We hope to meet him at many forthcoming INTDS events despite of his retirement.

Hans J. Maier
President INTDS

Calendar of Events 1992

January	February	March
		9th - 13th Karlsruhe, Germany International Symposium on Applications of Isotopes and Radiation in Conservation of the Environment Info: Conference Service Station, IAEA, P.O. Box 100, A-1400 Vienna, Austria
April	**May**	**June**
		1st - 5th Montegrotto Terme (Padova), Italy 6th International Conference on Electrostatic Accelerators and Associated Boosters Info: Mrs. M. Stefani, Laboratori Nazionali di Legnaro, Via Romera 4, I-35020 Legnaro (Padova), Italy Fax + 39-49-641 925 --- 8th - 12th Wik Castle, Uppsala, Sweden Third International Conference on Nuclear Microprobe Technology and Applications Info: Mrs. Roza Lundgren, Department of Radiation Sciences, Division of Physical Biology, Box 535, S-751 21 Uppsala, Sweden. Fax + 46-18-183 833
July	**August**	**September**
		21st - 25th Legnaro (Padua), Italy 16th World Conference of the International Nuclear Target Development Society Info: Mrs. M. Stefani, Laboratori Nazionali di Legnaro, Via Romera 4, I-35020 Legnaro (Padova), Italy Fax + 39-49-641 925

October	November	December
	2nd - 5th Denton Texas, USA 12th International Conference on the Application of Accelerators in Research and Industry Info: Dr. Jerome L. Duggan, Co-Chairman, Department of Physics, University of North Texas, P.O. Box 5368, Denton, Texas 76203-5368, USA	



International
Conference on the Application of
Accelerators in Research and Industry

FIRST ANNOUNCEMENT

SEPTEMBER 5, 1991

PLEASE POST

TWELFTH INTERNATIONAL CONFERENCE
on the
APPLICATION OF ACCELERATORS IN RESEARCH AND INDUSTRY
set for
November 2, 3, 4, 5, 1992
Denton, Texas

The Twelfth International Conference on the Application of Accelerators in Research and Industry will be held at the University of North Texas in Denton, Texas, November 2-5, 1992. Please note that this conference is four (4) days in length. The proceedings of the conference will be published in Nuclear Instruments and Methods in April 1992. The editors of these proceedings will be Jerome L. Duggan, The University of North Texas and I. L. Morgan, IDM, Inc.

The purpose of the conference is to review research, and the wealth of industrial applications that are in progress with accelerators throughout the world. The conference is composed of two symposia which run in parallel. These are the Research Symposium and the Industrial Applications of Accelerators. Some of the sessions which are of general interest will be held common to both groups. Participants can easily interchange between the two symposia. Three hundred and fifty invited papers will be given at these symposia and contributed papers will be accepted in the following areas: Atomic Physics and Related Phenomena, Trace & Surface Analysis with Ion Beams, Electron Beam Processing, Nuclear Physics, CTR & Related Phenomena, Neutron Activation Analysis & Bulk Analysis with Accelerators, Radiological Safety Aspects of Accelerators, Ion Implantation with Particular emphasis on Semiconductors & Metallurgical Applications, Geosciences & Related Phenomena, Charged Particle Microprobes, Super SIMS, Carbon Dating, Computed Tomography, Synchrotron Light Source Experiments, Insitu Beams, Radiation Interaction with Ion Beams, Accelerator & Component Design & Automation, Targetry, Detectors & Electronics, Medical Applications with Accelerators, Biological & Chemical Applications, Material Analysis with Ion Beams, Channeling, Stopping Power & Radiation Effects.

Most of the contributed papers will be presented in poster sessions. An abstract (invited and contributed) in APS format is required by 1 July, 1992. Designated times will be assigned for the participants to be present at their poster station.

Further information, application blanks, poster information, manuscript materials, and other conference information can be obtained by contacting Jerome L. Duggan, Department of Physics, The University of North Texas, P. O. Box 5368, Denton, Texas, 76203-5368. Telephone: (817)-565-3252 or (817)-565-3250
Fascimile or FAX: (817-565-2227), and
FC66@UNTVAX.BITNET.

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Remarks on simple production of ss molybdenum targets.

Targets of 92,98,100 Mo for experiments at NSL Stony Brook have been produced. They were used to study transfer reactions at energies near the Coulomb barier for the 32 S + 92,98,100 Mo systems.

All targets were prepared with a three stages procedure:

- converting isotopic Mo powder into the slug (sintering),
- melting and crystalizing the sample,
- rolling molybdenum to the required thickness.

1. Converting the Mo powder into the slug (sintering).

The powdered isotopic samples obtained from the Oak Ridge National Laboratory (ORNL) showing a bluish coloration -" molybdenum blue " (Mo_2O_5 xH_2O)[1] - were packed and pressed (50 mg) into a Ta nozzle (fig.1). No additional chemical reduction or treatment was performed on the powder at this stage. The nozzle was fixed to the H_2O cooled heart of the e-gun mounted in the vacuum chamber, and the system was evacuated to 10-6 Tr. The polarization voltage of 3 kV was applied between the filament and the heart of the e-gun. The slow increase of the filament current provided the necessary heat for H_2O removal and reduction of the oxide. At this stage, one observes an increase of pressure in the chamber (10-5 Tr) and then a return to the initial

[1] John P. Green, George E. Thomas, Proc. 15-th World Conf. of the INTDS, Santa Fe, NM, USA. Nuc. Inst. Meth. A 303 (1991) 165-167.

value. At this point the the current (heat) was increased again. The procedure was repeated until no significant change in the vacuum value was recorded. The temperature of the tantalum nozzle was increased up to 2600 -2650 K (controlled by optical pyrometer) for about 5 min. and within the next 20 min. the filament current (heating) was slowly reduced to zero. The vacuum chamber was pressurized and opened after the nozzle cooled down to the room temperature. The silverish - spongy looking- slag was easily removed from the tantalum nozzle (cutting, then unfolding). The loss of the weight of the sample was typically about 10-12 %.

2. Melting and crystalizing the slug.

Fresh e-gun cooper heart was used for the further processing of the molybdenum slug. The specimen was placed directly into the dimple of the heart, the system was evacuated to 10-6 Tr, and 3 kV applied to polarize the filament. The filament current was increased up to the point where the slug melted into a droplet of molybdenum. At that point the current was slowly decreased (within 20 min.) in order to avoid creation of stresses in the metal.

3. Rolling molybdenum to the required thickness.

The droplet of molybdenum was placed into the polished stainless steel envelope and pressed in the roller [2] . Several envelopes were

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[2] F.J. Karasek, Nucl. Instr. and Meth. 102 (1972) 457.

used in order to obtain the required thicknesses (up to 0.3 mg/cm2, no intermediate annealing was performed). Separation of the sample into 2 pieces was observed sometimes during the early stage of rolling. Fortunately all of them were large enough to obtain targets with the required surface area (1.5 cm) for framing.

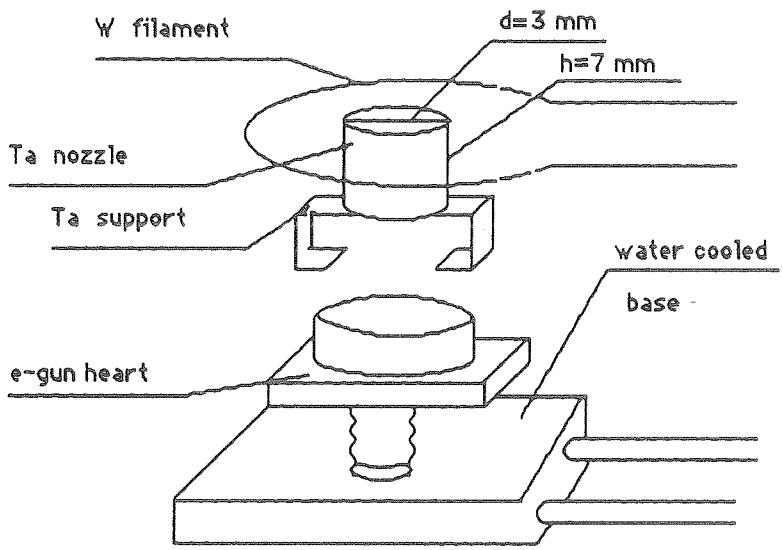

Fig.1. Expanded view of the Ta nozzle and e-gun used for production of molybdenum targets. 0.127 mm Ta foil was used to make the nozzle and support.

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Activity report

Targets listed in the table below have been prepared in the target laboratory between May 1990 and September 1991. Over 70 targets have been produced by various techniques.

ISOTPOE	Chem. form final	Chem. form initial	Backing	Target thick. µg/cm2	Method
208	Pb	Pb,PbO	ss,C	400-700	e
106	Cd	CdO	Pb	3500	r,p
93	Nb	Nb	ss	180-400	r
92,94,95,99 98,100,nat.	Mo	Mo	C,ss	50-1500	e,r
7	Li	Li	ss	2000-3500	r
141	Pr	Pr	ss,C	1500-1600	r
128	Te	Te	C,ss	800-1000	e,r
112,117,120 122, 124,nat	Sn	Sn	ss	160-3500	e,r
nat	Al	Al	ss	100-2000	e,r
nat	Au	Au	ss	100-400	e
nat	CaF2	CaF2	C	400-500	e
11,nat	B	B	ss	300-800	e
156,158	Gd	Gd	ss	500-700	r
nat	W	W	ss	300-400	r
nat	LiF	LiF	C	350-3500	e
108	Pd	Pd	Pb	2300-4800	r,p
203	Tl	Tl	C,ss	800-10000	e,r
nat	Zr+D2	D2+Zr	ss	1700	deuterised Zr
nat	Th	Th	ss	1000	r

e- vacuum evaporation (resisrive or "e" gun),
r- rolling between stainless steel plates,
p- two foils rolled- pressed together between stainless steel
nat- element in natural form/not separated isotopes,

SAMPLES AND TARGETS FOR NUCLEAR MEASUREMENTS DELIVERED BY CBNM DURING 1991*

J. PAUWELS, C. INGELBRECHT, P. ROBOUCH
Commission of the European Communities, Joint Research Centre,
Central Bureau for Nuclear Measurements (CBNM), Steenweg naar Retie,
CBNM, Geel

1. Preparation of Samples and Targets on Request

CBNM Sample Preparation Group supplied 927 samples in response to 49 orders from nine countries. In addition, 96 samples and targets covering 37 orders were supplied in support of the CBNM specific programme. The samples include thin actinide deposits (^{233}U, ^{235}U, ^{238}U, ^{237}Np, ^{239}Pu, ^{241}Pu, ^{241}Am, ^{243}Am) or stable isotopes (^{6}Li, ^{10}B) on metallic or plastic backings, bulk metallic and alloy samples (In, Zr, Fe, Pb, Cr, Ca, ^{235}U, alloys of Al and Au), samples from stable isotopes (^{61}Ni, ^{6}Li) and other samples from salts and organic compounds ($SrBr_2$, Li_2CO_3, Na_2CO_3, $C_3H_6N_6$, polythene).

2. Preparation of Hydrogen Reference Deposits

Evaporation of octacosanol onto polished tantalum backings were carried out for studies of homogeneity, behaviour in a neutron beam and to further develop a method for assay by combustion. These layers are required for a determination of the elastic scattering cross-section of hydrogen H(n,n)H.

3. Preparation of U-Pu Metallic Spikes

A range of alloy compositions has been prepared with additions of Nb, Zr, Ti, Al and Mo, in order to find a spike composition of suitable formability, homogeneity and solubility in acid. Foils of several compositions have been prepared and homogeneity control by γ-spectrometry and metallography has been carried out. These metallic spikes are required for IDMS assay of U and Pu in reprocessing plant input solutions.

* Work carried out as part of the European Community Research Programme

4. Characterization of ^{10}B and ^{6}Li Reference Deposits

Following the collaboration between CBNM, University of Sussex, NIST and SURRC Glasgow, which resulted in a redetermination of the free neutron lifetime, a new agreement between CBNM and NIST aims to achieve close to 0.1 % accuracy in neutron counting. An improved vacuum deposition facility has been installed for the preparation of new reference deposits in 1992.

5. Reactor Neutron Dosimetry

CBNM is collaborating with the Euratom Working Group on Reactor Dosimetry to prepare a series of activation and fission dosimetry reference materials. During 1991, 332 samples were ordered. Available materials are: Ni, Cu, Al, Fe, Nb and Rh certified for interfering trace elements, $^{238}UO_2$, $^{237}NpO_2$ and alloys of Al-Co and Al-Au. The transformation of a batch of high purity titanium metal into foil and wire was started, new Al-Co alloys were prepared via the powder route and the encapsulation of a large batch of NpO_2 and UO_2 microspheres in vanadium was started.

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WORKSHOP 1991

Nuclear Target Sub-society of China

Xu Guo ji

The workshop of Nuclear Target sub-society of China, NTSC was held at CIAE, Beijing, 8-10 October 1991. About 40 parcitioants from 10 laboratories and universities attended the meeting. Dr.P.Maier-Komor, T.U.Muenchen, F.R.Gemany, was invited to the workshop and asked to give two invited lecturers.

The information excgange covered the topics including:

(1) recent progress of target making,
(2) target preparation with vacuum evaporation,
(3) laser ablation for isotopic target preparation,
(4) a review about carbon foils,
(5) carbon stripper foils,
(6) electron beam evaporation and
(7) isotopic target preparation with rotating target-substrate fixtures.

The 4th national symposium of NTSC will be held at South-West Institute of Nuclear Physic and Chemistry, Chengdu, in 1992, with Mrs. Chang Fu hua as hostess.

TARGET PREPARATION TECHNIQUES REQUEST
THIN SILICON TARGETS

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We are interested in learning of any techniques that other labs utilise to reduce Silicon-Oxide target material (in our case Si-29) to metal form for evaporation onto thin carbon foil target backings (5 $\mu g/cm^2$).

We typically utilize targets in the range of 1 - 3 micrograms/cm^2 to minimise the energy loss of the proton beam to under 100 eV. In the past we have obtained some Silicon in metal form from ORNL but the conversion costs are now too high for our budget. We have also reduced SiO_2 in a Tantalum closed boat with Ta powder for previous experiments. Using an electron gun produced targets of SiO. The presence of Oxygen in the targets is a problem we wish to avoid.

The evaporation using a Tantalum boat is difficult as one can easily get a lot of Tantalum contamination on the targets. The evaporation must be performed at a temperature just above the melting point of the SiO_2. We find that the results are not always reproducible and often we obtain SiO_2 or SiO targets which are not usable.

Any alternative techniques that you are willing to share would be most appreciated.