32èmes Journées des Actinides

Ein-Gedi, Israel, 19-22 March 2002

ימי האקטינידים ה-ל"ב

עין-גדי, ו'-ט' בניסן התשס"ב

EuroConference

preceded by the

Fourth School on Physics and Chemistry of Actinides
Ein-Gedi, Israel, 17-18 March 2002

and

a session celebrating the 50th anniversary of the discovery of
the ferromagnetism of uranium hydride (UH_3)
by W. Trzebiatowski and his co-workers in Wrocław, Poland
Ein-Gedi, Israel, evening of 18 March 2002

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The Organizing Committee

Moshe KUZNIETZ (NRCN, Beer-Sheva), Chairman
Uzi ATZMONY (NRCN, Beer-Sheva), Israeli member
Gerry H. LANDER (ITU, Karlsruhe), European member

The present EuroConference,
held in Ein-Gedi, Israel, in the week of 17-22 March 2002,
acknowledges support from the
European Commission
for funding for both the
Fourth School on Physics and Chemistry of Actinides (4SPCA)
and the 32èmes Journées des Actinides (32JA)
in the framework of the
Program for High-Level Conferences..

The organization of the 4SPCA and 32JA in Ein-Gedi
was carried out under the auspices of the
Israel Atomic Energy Commission (IAEC),
celebrating this year its 50th anniversary, and its
Nuclear Research Centre – Negev (NRCN).

Preface

The 32èmes Journées des Actinides (32JA) and the fourth bi-annual School on Physics and Chemistry of Actinides (4SPCA) are held at the guest-house of kibbutz Ein-Gedi, Israel, an oasis on the shore of the Dead Sea, the lowest place on Earth (- 417 m), during the week of Sunday, 17 March 2002, to Friday, 22 March 2002. According to the six-year tradition, the 4SPCA (17-18 March 2002) precedes the 32JA (19-22 March 2002). The full financial support of the European Commission (EC) to the 4SPCA, the partial EC support of the 4SPCA lecturers, and the EC support of qualified 4SPCA students (including the 32JA and travel) institute the 32JA as a EuroConference.

The Journées des Actinides (JA) are a series of informal meetings devoted to the physics and chemistry of the actinides. The conference series started in 1972 in Grenoble, France, as a semi-annual meeting, providing its French title. It became annual since the 5JA, held in Fontenay-aux-Roses, France, in 1975. It is a European gathering, with a few participants coming from outside of Europe, and with an active participation of Israeli scientists. Indeed, the 13JA was held in Elat, Israel, in 1983, bringing together 52 foreign scientists and about 18 Israelis.

The 32JA coincides with the 50th anniversary of the discovery of the ferromagnetism of uranium hydride (UH_3) by Włodzimierz TRZEBIATOWSKI and his co-workers in Wrocław, Poland, and this event is celebrated in a special evening session on 18 March 2002, between the 4SPCA and 32JA, with a review by Robert TROĆ of Trzebiatowski Institute in Wrocław on the research conducted on UH_3 since the discovery of its ferromagnetism. Evidently, quite a large Polish delegation is coming to the 32JA.

The Organization of the 32JA in Israel was proposed to me by Gerry LANDER back in November 1999, in peaceful times, and I accepted to do it in Ein-Gedi, following approval by the Nuclear Research Centre - Negev. The first presentation of the 32JA was done at the 30JA in Dresden, and preparations continued under calm conditions, till the end of September 2000. From this time and on the organization continued in spite of the events in Israel and the territories, including invitation of 4SPCA lecturers and detailed presentation of the 4SPCA and 32JA at the 31JA in St. Malo, France. My persistence on keeping the program as scheduled stemmed from the full support I received from Gerry LANDER and the ITU scientists.

The 32JA is held in Ein-Gedi with an extremely low attendence of 50 participants, half of them from abroad, with just 38 oral and poster presentations. Nevertheless, the 4SPCA schedule includes a variety of lectures and an extremely large overall attendance. I highly appreciate the arrival of our colleagues from abroad, that did not abandon us in these difficult times. When better conditions will prevail in Israel, they should come and be our most esteemed guests. I wish all active participants and accompanying persons a good meeting in the very special site of Ein-Gedi.

Moshe Kuznietz
Chairman,
32JA Organizing Committee

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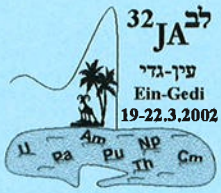
Ein-Gedi, Israel, 19-22 March 2002



ימי האקטינידים ה-ל״ב

עין-גדי, ו׳-ט׳ בניסן התשס״ב

4SPCA and 32JA Program

4SPCA and 32JA Program

Sunday, 17 March 2002

1230-1330	Lunch for early-arriving 4SPCA participants
1400-1830	Get together and administrative arrangements
1830-2000	Dinner for the 4SPCA participants
2030-2230	**4th School on Physics and Chemistry of Actinides (4SPCA)** Coordinator: Moshe KUZNIETZ
2030-2130	4SPCA lecture by Franck WASTIN (ITU, Karlsruhe, Germany) "Insight in solid state chemistry of transuranium elements: Sample preparation and characterization"
2130-2230	4SPCA lecture by Wojciech SUSKI (Trzebiatowski Ins,Wrocław, Poland) "Preparation, magnetic, and related properties of $ThMn_{12}$-type actinide and lanthanide compounds"

Monday, 18 March 2002

0700-0830	Breakfast for the 4SPCA participants
0830-1200	**4th School on Physics and Chemistry of Actinides (4SPCA)** Coordinator: Moshe KUZNIETZ
0830-0930	4SPCA lecture by Peter M. OPPENEER (IFW, Dresden, Germany) "The electronic structure of actinide materials from first-principles theory"
0930-1030	4SPCA lecture by Gerry H. LANDER (ITU, Karlsruhe, Germany) "Neutron scattering in the study of actinides"
1030-1100	Coffee break
1100-1200	4SPCA lecture by Pekka PYYKKÖ (University of Helsinki, Finland) "Chemical bonds in actinide molecules"
1300-1430	Lunch for the 4SPCA participants

1430-1800 **4th School on Physics and Chemistry of Actinides (4SPCA}**
Coordinator: Moshe KUZNIETZ

1430-1530 4SPCA lecture by Gerry H. LANDER (ITU, Karlsruhe, Germany)
"Synchrotron radiation in the study of acctinides"

1530-1630 4SPCA lecture by Moris S. EISEN (Technion, Haifa, Israel)
"Designing catalytic reactions with organoactinides"

1630-1700 Coffee break

1700-1800 4SPCA lecture by Moshe H. MINTZ (NRCN, Beer-Sheva, Israel)
"Thermodynamic and kinetic properties of actinide hydrides"

1830-2000 Dinner for the 32JA participants

2030-2200 **Celebrating the 50th anniversary of the discovery of ferromagnetism of uranium hydride by Trzebiatowski *et al.* in Wrocław, Poland**
Chairperson: Jan GENOSSAR

2030-2040 Krzysztof BOJKO, Press Officer at the Polish Embassy (Tel-Aviv)
"Greeting for the anniversary celebration"

2040-2050 Moshe KUZNIETZ (NRCN, Beer-Sheva, Israel)
"Development of the Polish-Israeli actinide-science relations"

2050-2100 Jan GENOSSAR (Technion, Haifa, Israel)
"Włodzimierz Trzebiatowski and actinide science"

2100-2200 4SPCA lecture by Robert TROĆ (Trzebiatowski Inst., Wrocław, Poland)
"The 50th anniversary of the discovery of the ferromagnetism in uranium hydride by Trzebiatowski *et al*"

Tuesday, 19 March 2002

0700-0830 Breakfast for the 32JA participants

0830-1000 **32èmes Journées des Actinides (32JA) - Opening session**
Chairperson: Moshe KUZNIETZ

32JA OPENING ADDRESS
Dov SHVARTS, Deputy Director,
Nuclear Research Centre - Negev (NRCN), Beer-Sheva, Israel

32JA ORGANIZING COMMITTEE REPORTS
Gerry H. LANDER (ITU, Karlsruhe, Germany), European Member
Uzi ATZMONY (NRCN, Beer-Sheva, Israel), Israeli Member
Moshe KUZNIETZ (NRCN, Beer-Sheva, Israel), Chairman

1000-1100 **32JA Session A**
Chairperson: Pekka PYYKKÖ

1000-1030 32JA oral contribution **A1**
ELECTRONIC STRUCTURE INVESTIGATION OF AMERICIUM MONOPNICTIDES
Dipta B. GHOSH, Subodh K. DE, Peter M. OPPENEER, and Michael S. S. BROOKS

1030-1100 32JA oral contribution **A2**
CRYSTAL STRUCTURE AND AGING OF PLUTONIUM-238 METAL
Sergey I. GORBUNOV and Anatoly G. SELEZNEV

1100-1130 Coffee break

1130-1230 **32JA Session B**
Chairperson: Wojciech SUSKI

1130-1200 32JA oral contribution **B1**
EXAFS STUDIES OF THE Am^{3+} AND Cm^{3+} AQUO IONS
Harald FUNKE, Thorsten STUMPF, Andre ROSSBERG, Christoph HENNIG, and Tobias REICH

1200-1230 32JA oral contribution **B2**
RAMAN SCATTERING AND LUMINESCENCE IN UO_2 AND OXIDIZED URANIUM SURFACES
Tsachi LIVNEH

1230-1400 Lunch for the 32JA participants

1430-1600 **32JA Session C**
Chairperson: Yoshinobu SHIOKAWA

1430-1500 32JA oral contribution **C1**
PREDICTIONS FOR NEW, EXOTIC ACTINIDE SPECIES
Pekka PYYKKÖ

1500-1530 32JA oral contribution **C2**
PECULIARITIES OF THE CHEMICAL BOND IN THORIUM COMPOUNDS AND FINE X-RAY PHOTOELECTRON AND $O_{4,5}$(Th) EMISSION SPECTRAL STRUCTURE
Yury A. TETERIN, Vladimir A. TEREHOV, Mikhail V. RYZHKOV, Anton Yu. TETERIN, Igor O. UTKIN, Kirill E. IVANOV, and Labud J. VUKCHEVICH

1530-1600 32JA oral contribution **C3**
NOVEL REACTIVITY OF THE CATIONIC COMPLEX
Jiaxi WANG, Aswini K. DASH, Jean-Claude BERTHET, Michel EPHRITIKHINE, and Moris S. EISEN

1600-1630 Coffee break

1630-1800 32JA Session D
Chairperson: Julia STĘPIEŃ-DAMM

1630-1700 32JA oral contribution **D1**
MICROSTRUCTURES AND CRYSTALLOGRAPHY OF U-Mo α″ PHASE
Efraim DABUSH, Giora KIMMEL, Itzhak DAHAN, and Joseph SARIEL

1700-1730 32JA oral contribution **D2**
LONG-TERM AMORPHIZATION OF C^+ AND N_2^+ IMPLANTED LAYERS ON A URANIUM SURFACE
Rami ARKUSH, Moshe H. MINTZ, Giora KIMMEL, and Noah SHAMIR

1730-1800 32JA oral contribution **D3**
THE ADVANTAGES OF THE ANISOTROPIC PROPERTIES OF α-URANIUM FOR THE STUDY OF PLASTICITY
Gabriel A. FRANK, Roni Z. SHNECK, Alex LANDAU, and Arie VENKERT

1830-2000 Dinner for the 32JA participants

2000-2200 32JA poster session P

32JA poster contribution **P1**
MAGNETIC ORDERING OF $ThFe_xAl_{12-x}$ POWDER SAMPLES
Katarzyna REĆKO, Ludwik DOBRZYŃSKI, Krzysztof SZYMAŃSKI, Dariusz SATUŁA, Krystyna PERZYŃSKA, Maria BIERNACKA, Piotr ZALESKI, Janusz WALISZEWSKI, Wojciech SUSKI, Konrad WOCHOWSKI, Michael HOFMANN, and Dietmar HOHLWEIN

32JA poster contribution **P2**
SPECIFIC HEAT OF THE $UCu_{4+x}Al_{8-x}$ DERIVATIVES
Wojciech SUSKI, Andrzej CZOPNIK, and Konrad WOCHOWSKI

32JA poster contribution **P3**
ELECTRONIC STRUCTURE OF THE COMPOUNDS YFe_4Al_8 AND $ScFe_4Al_8$ – COMPARISON WITH THE ISOSTRUCTURAL UFe_4Al_8
Ewa TALIK, Marek KULPA, Wojciech SUSKI, and Robert TROĆ

32JA poster contribution **P4**
ELECTRONIC AND MAGNETIC PROPERTIES OF $U_2Cu_3X_9$ (X = Al, Ga)
André M. STRYDOM, Robert TROĆ, and Andrzej CZOPNIK

32JA poster contribution **P5**
MAGNETOTRANSPORT AND THERMAL PROPERTIES OF UFe_5Sn SINGLE CRYSTAL
Robert TROĆ, Konrad WOCHOWSKI, Andrzej CZOPNIK, Halina MISIOREK, Czesław SUŁKOWSKI, Danuta WŁOSEWICZ, and Takemi KOMATSUBARA

32JA poster contribution **P6**
TRANSPORT AND THERMODYNAMIC PROPERTIES OF THE URANIUM PNICTOCHALCOGENIDE UPS
Andrzej WOJAKOWSKI, Tomasz CICHOREK, Ryszard WAWRYK, Zygmunt HENKIE, and Frank STEGLICH

32JA poster contribution **P7**
CRYSTAL STRUCTURE OF NEW TERNARY URANIUM INDIDES
Julia STĘPIEŃ-DAMM, Vasyl' ZAREMBA, and V. HLUKHYY

32JA poster contribution **P8**
COMPUTER CALCULATIONS OF THE FINE ELECTRONIC STRUCTURE AND PROPERTIES OF *4f/5f*-ELECTRON COMPOUNDS
Rafal MICHALSKI and Ryszard J. RADWANSKI

32JA poster contribution **P9**
PHASE TRANSFORMATION AND MICROSTRUCTURE OF BINARY URANIUM-GALLIUM ALLOYS
Shai SALHOV, Giora KIMMEL, Uzi ATZMONY, and Moshe P. DARIEL

32JA poster contribution **P10**
HETEROGENEOUS HYDROGEN ATTACKS ON URANIUM ALLOYS
Daniel MORENO

32JA poster contribution **P11**
FUNDAMENTAL STUDIES OF URANIUM AND NEPTUNIUM REDOX FLOW BATTERIES (II)
Yoshinobu. SHIOKAWA, T. YAMAMURA, and N. WATANABE

32JA poster contribution **P12**
RENORMALIZATION OF THE WEAKLY-INTERACTING SPIN CHAINS IN A FIELD
Józef SZNAJD

32JA poster contribution **P13**
DETERMINATION OF No^{3+} IONIC RADIUS AND CONTRACTION OF ACTINIDES 3+ IONIC RADII IN THE END OF THE SERIES
Aleksander BILEWICZ

32JA poster contribution **P14**
AB INITIO STUDIES OF ACTINIDE SPECIES
Michal STRAKA

32JA poster contribution **P15**
CATALYTIC EFFECT IN OPENING THE COORDINATION SPHERE OF AN ORGANO-f-COMPLEX
Tamer ANDREA, Jiaxi WANG, Ilya GOUREVICH, and Moris S. EISEN

32JA poster contribution **P16**
CATALYTIC REACTIONS PROMOTED BY ORGANOACTINIDES
Eyal BARNEA and Moris S. EISEN

32JA poster contribution **P17**
THORIUM OXIDE DISSOLUTION KINETICS FOR HYDROXIDE AND CARBONATE COMPLEXATION
Richard JARDIN, Virginia CURRAN, and Kenneth R. CZERWINSKI

32JA poster contribution **P18**
INFLUENCE OF TEMPERATURE ON PENTAVALENT Np SORPTION AND DESORPTION ONTO GOETHITE, MONTMORILLONITE
Marc A. VIAL, Christina SHERMAN, Kenneth R. CZERWINSKI, and Donald REED

32JA poster contribution **P19**
THERMODYNAMIC INVESTIGATIONS OF THE LIQUID PHASE IN THE $MnCl_2$-UCl_4 SYSTEM
Wiesław GAWEŁ, Agata GÓRNIAK, and Alina WOJAKOWSKA

2215-2300 Special (optional) lecture by Ayala GILAD (Kibbutz Ein-Gedi)
"The secret of unity: The Ein-Gedi story"

Wednesday, 20 March 2002

0700-0830 Breakfast for the 32JA participants

0830-1000 **32JA Session E**
Chairperson: Peter M. OPPENEER

0830-0900 32JA oral contribution **E1**
EMPIRICAL COMPARISON BETWEEN SUPERCONDUCTING URANIUM COMPOUNDS AND THEIR Np/Pu HOMOLOGUES
Franck WASTIN, Pascal BOULET, Eric COLINEAU, and Jean REBIZANT

0900-0930 32JA oral contribution **E2**
MAGNETIC FLUCTUATIONS IN THE ORDERED STATE OF THE FERROMAGNETIC SUPERCONDUCTOR UGe_2
Robert TROĆ, Takemi KOMATSUBARA, Czesław SUŁKOWSKI, and Halina MISIOREK

0930-1000 32JA oral contribution **E3**
AMBIENT AND HIGH-PRESSURE STRUCTURE OF UAl_4 PREPARED BY SOLID-STATE REACTION
Itzhak HALEVY, Victor Y. ZENOU, Eran STERER, Giora KIMMEL, Michael AIZENSHTHEIN, and Ilan YAAR

1000-1030 Coffee break

1030-1200 32JA Session F
Chairperson: Andrzej WOJAKOWSKI

1030-1100 32JA oral contribution **F1**
THE BINARY SYSTEM Np-Si AND THE MAGNETIC PROPERTIES OF Np_3Si_2
Pascal BOULET, Eric COLINEAU, Franck WASTIN, and Jean REBIZANT

1100-1130 32JA oral contribution **F2**
MAGNETIZATION DENSITIES IN UPtAl STUDIED BY POLARIZED NEUTRON DIFFRACTION
Pavel JAVORSKÝ, Françoise GIVORD, Jean-Xavier BOUCHERLE, Eddy LELIEVRE-BERNA, Alexander V. ANDREEV, Vladimir SECHOVSKÝ, and Frederic BOURDAROT

1130-1200 32JA oral contribution **F3**
THE $U(Co_{1-x}Cu_x)_2Ge_2$ SYSTEM STUDIED BY AC-SUSCEPTIBILITY AND SQUID-MAGNETIZATION MEASUREMENTS
Moshe DUBMAN, Hanania ETTEDGUI, and Moshe KUZNIETZ

1200-1330 Lunch for the 32JA participants

1400-1800 Dead-Sea floating, black mud, and Ein-Gedi Spa

1830-2000 Dinner for the 32JA participants

2000-2200 32JA poster session P (continuation of Tuesday's session)

Thursday, 21 March 2002

0700-0815 Breakfast for the 32JA participants

0830-1300 Guided Tour of Metzada (Massada)
(Foreign participants transported by Israeli participants)

1300-1430 Lunch for the 32JA participants

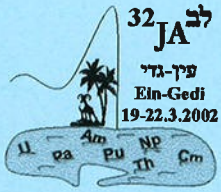
1430-1600	**32JA Session G** Chairperson: Robert TROĆ
1430-1500	32JA oral contribution **G1** HIGH–FIELD–MAGNET EXPERIMENTS ON US SINGLE CRYSTALS Andrew CHRISTIANSON, Gerry H. LANDER, Sandy KERN, Neil HARRISON, and Oscar VOGT
1500-1530	32JA oral contribution **G2** RESONANT X-RAY SCATTERING FROM MULTI-**k** MAGNETIC STRUCTURES Matt J. LONGFIELD, Jose A. PAIXÃO, Nick BERNHOEFT, and Gerry H. LANDER
1530-1600	32JA oral contribution **G3** SOME PRELIMINARY STUDIES OF ACTINIDE SYSTEMS THAT NEED COMPLETION: UBi, (U,Ce)N, ThM_2X_2 (M=Co,Ni,Cu;X=Si,Ge) Moshe KUZNIETZ
1600-1630	Coffee break
1630-1730	**Panel Discussion on the Future of Actinide Basic Research** Coordinator: Gerry H. LANDER
1730-1800	**Summaries of the 4SPCA and 32JA;** **Announcements on Future JA's**
1900-2100	Banquet for the 32JA participants
2100-2200	Special lecture by Yuval BARTOV (Kibbutz Ein-Gedi) "Lake levels of the Dead Sea during the last glacial period"

Friday, 22 March 2002

0700-0830	Breakfast for the 32JA participants
0900-1130	Guided Tour of the Botanical Garden in kibbutz Ein-Gedi
1200-1330	Lunch for the 32JA participants
1400	Farewell Departure for the Center of Israel

32èmes Journées des Actinides

Ein-Gedi, Israel, 19-22 March 2002



ימי האקטינידים ה-ל״ב

עין-גדי, ו׳-ט׳ בניסן התשס״ב

Fourth School on the Physics and Chemistry of the Actinides

4th School on Physics and Chemistry of Actinides (4SPCA)

Starting with the 26èmes Journées des Actinides held in Szklarska Poręba, Poland, in 1996, a bi-annual School on the Physics and Chemistry of Actinides (SPCA) preceded the meeting (held in Wrocław). Following the 2SPCA that preceded the 28JA in Uppsala, Sweden, in 1998 and the 3SPCA that preceded the 30JA in Dresden,Germany, in 2000, the 4SPCA precedes the 32JA in Ein-Gedi in 2002. Its main goal is the introduction of young scientists into the field of basic properties of the actinides, possibly as future support to the nuclear science and industry. Together with the young scientists coming to the School from abroad, mainly from the European Union and its associated countries, young Israelis participate in the School, benefitting from the fact that it is held in Israel. For some of these Israelis it will be the only possible way to be exposed to the subject matter involved in the School and the Journées.

The present EuroConference (including the 4SPCA and 32JA) is supported by the European Commission in the framework of the program for High-Level Conferences. Qualified students under the age of 35, with nationality of the EU and its associated states, residing in these states or elsewhere, are supported throughout the 4SPCA and the 32JA, and reimbursed for their economy-class travel from their original countries of nationality to Israel and back, provided that they present contributions at the 32JA. The 4SPCA lecturers receive partial financial support for their 32JA participation.

The 4SPCA lecturers and their lecture titles and times of presentation are the following:

Sunday,17 March 2002

2030-2130 Franck WASTIN (ITU, Karlsruhe, Germany)
"Insight in solid state chemistry of transuranium elements: Sample preparation and characterization"

2130-2230 Wojciech SUSKI (Trzebiatowski Institute,Wrocław, Poland)
"Preparation, magnetic, and related properties of $ThMn_{12}$-type actinide and lanthanide compounds"

Monday, 18 March 2002

0830-0930 Peter M. OPPENEER (IFW, Dresden, Germany)
"The electronic structure of actinide materials from first-principles theory"

0930-1030 Gerry H. LANDER (ITU, Karlsruhe, Germany)
"Neutron scattering in the study of actinides"

1100-1200 Pekka PYYKKÖ (University of Helsinki, Finland)
"Chemical bonds in actinide molecules"

1430-1530 Gerry H. LANDER (ITU, Karlsruhe, Germany)
"Synchrotron radiation in the study of acctinides"

1530-1630 Moris S. EISEN (Technion, Haifa, Israel)
"Designing catalytic reactions with organoactinides"

1700-1800 Moshe H. MINTZ (NRCN, Beer-Sheva, Israel)
"Thermodynamic and kinetic properties of actinide hydrides"

2100-2200 Robert TROĆ (Trzebiatowski Institute, Wrocław, Poland)
"The 50th anniversary of the discovery of the ferromagnetism in uranium hydride by Trzebiatowski *et al*"

32èmes Journées des Actinides
Ein-Gedi, Israel, 19-22 March 2002

32 JA לב
עין-גדי
Ein-Gedi
19-22.3.2002

ימי האקטינידים ה-ל"ב
עין-גדי, ו'-ט' בניסן התשס"ב

Trzebiatowski

UH_3 session

The 50th anniversary of the discovery of the ferromagnetism of uranium hydride (UH_3)
by Włodzimierz TRZEBIATOWSKI and co-workers in Wrocław, Poland,
will be celebrated in a special evening session,
following the
Fourth School on Physics and Chemistry of Actinides (4SPCA)
and preceding
the **32èmes Journées des Actinides (32JA),**
at the guest-house of kibbutz Ein-Gedi, on Monday, **18 March 2002**.

The discovery, reported in the original short paper (souvenir copy enclosed)
Własności magnetyczne metalicznego uranu i wodorku uranu
(Magnetic properties of metallic uranium and uranium hydride)
by Włodzimierz TRZEBIATOWSKI, Alfred ŚLIWA, and Bohdan STALIŃSKI,
which effectively started the basic research on the physics and chemistry of actinide systems, with which the Journées des Actinides are concerned, was published in Roczniki Chemii **26** (1952) 110-112, with a receipt date of **17 March 1952**.

This paper was followed by a more detailed paper
Własności magnetyczne wodorku i deuterku uranu
(Magnetic properties of uranium hydride and deuteride)
by Włodzimierz TRZEBIATOWSKI, Alfred ŚLIWA, and Bohdan STALIŃSKI,
published in Roczniki Chemii **28** (1954) 12-20, with a receipt date of **2 July 1953**.

Monday, 18 March 2002

2030-2200	**Session celebrating the 50th anniversary of the discovery of UH_3 ferromagnetism by Trzebiatowski *et al.* in Wrocław, Poland** Chairperson: Jan GENOSSAR
2030-2040	Krzysztof BOJKO, Press Officer at the Polish Embassy (Tel-Aviv) "Greeting for the anniversary celebration"
2040-2050	Moshe KUZNIETZ (NRCN, Beer-Sheva, Israel) "Development of the Polish-Israeli actinide-science relations"
2050-2100	Jan GENOSSAR (Technion, Haifa, Israel) "Włodzimierz Trzebiatowski and actinide science"
2100-2200	4SPCA lecture by Robert TROĆ (Trzebiatowski Inst., Wrocław, Poland) "The 50th anniversary of the discovery of the ferromagnetism in uranium hydride by Trzebiatowski *et al*"

ROCZNIKI CHEMII
26, 110 (1952)

WŁASNOŚCI MAGNETYCZNE METALICZNEGO URANU I WODORKU URANU

Magnetic properties of metallic uranium and uranium hydride

W ramach systematycznych badań własności magnetycznych niektórych metali przejściowych i ich związków z wodorem, zmierzono również współczynniki podatności magnetycznej metalicznego uranu i wodorku uranu UH_3.

Zastosowana została znana metoda G o u y a przy użyciu elektromagnesu*) wzbudzonego maksymalnie do natężenia pola 10.810 gaussów. Oznaczenie współczynnika podatności magnetycznej przeprowadzono w zakresie temperatur od 80° do 292°K dla uranu metalicznego, a od 80° do 462°K dla wodorku uranu. Temperatura mierzona była cechowanym termometrem oporowym lub rtęciowym**). Stosowano pręt uranu metalicznego o średnicy 2,0 mm, długości 154 mm, ciężarze 9,291 g, czystości spektralnie kontrolowanej, wykazujący tylko ślady zawartości obcych metali. Jako substancję wzorcową stosowano sól M o h r a ($\chi = 32{,}76.10^{-6}$ — 20°C) oraz 20,01% roztwór chlorku niklawego ($\chi = 6{,}32.10^{-6}$ — 20°C), a mierzone współczynniki χ ekstrapolowano na $H \infty$. Wyniki podaje tablica 1.

T a b l i c a 1

Uran metaliczny

Temp. °Kelvina	Natężenie pola w gaussach				
	4790	7670	9320	10.810	ekstrapolowane na $H \to \infty$
80	2,42	2,17	2,10	2,04	$1{,}75.10^{-6}$
135	2,34	2,10	2,03	1,97	1,69
165	2,10	1,96	1,91	1,87	1,68
186	1,84	1,78	1,76	1,75	1,68
292	1,80	1,77	1,75	1,73	1,67

*) Konstrukcja własna.

**) Opis aparatury podany zostanie w szczegółowej publikacji

Z tablicy tej wynika, że w temperaturach poniżej 186°K występuje zależność współczynnika podatności magnetycznej od natężenia pola, która w temperaturach wyższych jest bardzo nieznaczna.

Własności magnetyczne uranu metalicznego w niższych temperaturach nie były dotąd badane. Ostatnio wyznaczono je dla czystego metalu[1]) w zakresie temperatur od +20° do +350°C, przy czym wartość współczynnika podatności przy +20°C wyniosła $1{,}74.10^{-6}$, a więc była bardzo zbliżona do osiągniętego przez nas wyniku.

O własnościach magnetycznych wodorku uranu UH_3 informuje jedynie krótka wzmianka[2]), że związek ten jest silniej paramagnetyczny od metalicznego uranu. Do naszych badań wodorek uranu syntezowano z metalicznego uranu i wodoru uzyskanego przez rozkład wodorku palladu w aparaturze próżniowej, wykluczającej powietrze i umożliwiającej bezpieczne przesypanie pyroforycznego produktu do rurki szklanej, w której dokonywano pomiaru współczynnika podatności**). Masa wodorku wynosiła 3,641 g. Z uwagi na wysoką wartość χ dokonywano pomiarów przy maksymalnie 5.040 gaussach. Uzyskane wyniki podano w tablicy 2.

Tablica 2

Wodorek uranu UH_3

Temperatura °Kelvina	χ
195	$+183{,}4 \cdot 10^{-6}$
255	38,6
273	31,1
295	25,9
337	19,2
366	16,6
391	14,8
426	13,0
462	11,7

Wodorek uranu w przeciwieństwie do metalu wykazuje wybitną zależność temperaturową χ. W temperaturach wyższych nie stwierdzono zależności χ od natężenia pola magnetycznego. Natomiast poniżej 173°K wodorek uranu staje się ferromagnetyczny. Jest to pierwszy przypadek ferromagnetyzmu w związkach aktynowców, podczas gdy u lantanowców znany jest od dawna ferromagnetyzm czystych metali w rodzaju gadolinu i innych.

Dalsze badania nad wodorkiem a także deuterkiem uranu — w toku.

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LITERATURA CYTOWANA

1. Bates L. F. i Mallard J. R., *Proc. Phys. Soc. B* 63, 520 (1950).
2. Rundle R. E., *J. Am. Chem. Soc.* 73, 4172 (1951).

SUMMARY

The magnetic susceptibilities of pure metallic uranium and uranium hydride were determined in the temperature range from 80° to 292°K and from 80° to 462°K respectively. Metallic uranium offers paramagnetic properties, practically independent of temperature. Uranium hydride is strongly paramagnetic with a high positive temperature increment. Below 173°K UH_3 has ferromagnetic properties.

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