Grants

Deutscher akademischer austauschdienst, Bonn, Germany
DAAD-Stipendium fur die Russische Federation -1997

Problem: NEW FUNCTIONAL MATERIALS FOR TREATMENT OF INDUSTRIAL WASTE. Characterization of properties of new sorbents and membranes prepared in Russia for the treatment of gaseous waste stream.

Host institute: GSF-Forschungszentrum fur Umwelt und Gesundheit GmbH, Institut fur Okologische Chemie (GSF-Institute of environmental chemistry), Neuherberg, Oberschleissheim, Germany

FZK-Forschungzentrum fur Technik und Umwelt: Institute fur Technische Chemie, Bereich Chemisch-Physikalische, Karlsruhe, Dr.R.Stahl

GKSS-Forschung, Institute fur Chemie, Bereich Membrane Technik, Geestacht, Gamburg, Prof. Dr.K.W.Boddeker Сроки командировки: 3 месяца, с 1-го августа по 31 октября 1997 г

Plan of activities by Prof.Dr.I.N.Beckman in the frame of the DAAD grant

1. Thermal; analysis methods of the determination of the environmental impact of industrial products during their production, use, recycling and waste management (i.e. for the life cycle analysis of industrial products). Following materials will be tested by means of the DTA and TG coupled with mass spectrometry, available at the GSF: plastics, special (high tech) materials, such as solar cell, spent separation membranes, etc. (Exchange of experience, experimental testing of plastics and other products produced in Russian Federation).
2. Methods for data acquisition and their processing in the life cycle analysis (Information will be used in the preparation of lectures for Moscow State University).

Visit to our institute Dear Professor Bekman, from Professor Balek I know that you interested to spend some time as a guest scientist in the GSF-Institute of Ecological Chemistry. I agree with this idea and would happy to have you in Munich. For that Purpose I need a research plan your stay. Concerning financial support there are two possibilities. First, you have to send a proposal to the German Academic Exchange Service (DAAD) via the German embassy in Moscow. DAAD pays travel and accommodation expenses. Second possibility is a fellowship by our research centre. But unfortunately we are not able to pay the travel express. Looking forward to your answer. Yours sincerely, Prof. Dr. A.Kettrup. April 1995.

DEUTSCHER AKADEMISCHER AUSTAUSCHDIENST

Studienaufenthalte auslandischer Wissenschaftler in der Bundesrepublik Deutschland Programmabteilung NORD

Betr.: Ihre Bewerburg um ein Stipendium in Deutschland Sehr geehrter Herr Professor Bekman, wir mochten Sie daruber informatieren, dass die Auswahlkomission des Deutschen Akademisched Austauschdienstes Sie als Reserverkandidaten fur einen Stipendinaufenhalt im Haushaltsjahr 1996 vorgeschlagen hat. Eine Stipendienzusage kann leider nur dann erstellt werden, wenn uns dafur zusatzliche Finanzmittel aus dem Bundeshaushalt zur Verfugung gestelt werden. Wir sind darum bemuht, Ihnen so schnell wie moglich den endgultigen Bescheid uber eine mogliche Stipendienforderung mitteilen zu konnen. Mit freundlichen Grussen, Dr. Peter Hiller.

Hern Professor Dr. Igor N.Bekman Chemische Fakultate Moskauer Staatsuniversitat Moskau 199234 Russland Einladung zu ienem 3-monatigen Aufenthalt im Rahmen eines DAAD-Stipendiums Sehr geehrter Herr Professor Bekman, Wie mit Ihnen anlasslich Ihres Aufenthalts in Neuherberg besprochen, lade ich Sie im Jahre 1997 zu o.g. Aufenthalt im Institut fur Okologische der GSF ein. Wahrend dieses 3-monatigen Aufenthalts, werden Sie uber die Charakterisirung der anorganisched Sorbentien, die aus Basalt-Fasern in Ihrem Labor hergestellt wurden, arbaiten. Die Apparatur fur die thermische Analyse, gekoppelt mit der Massenspektrometrie steht Ihnen warend dieses Aufenthaltes zur Verfugung. Mit freundlichen Grussen Prof. Dr. A.Kettrup.

Studienauffenthalt in Deutschland Hier: Professor Dr.Bekman, Moskau, MGU Annahmeerklarung

Ich nehme die Forderungszusage des DAAD fur meinen Studienaufenhalt in Deutschland an. Mir ist bekant, das der DAAD seine Zusage zuruckziehen kann und von mir bereits erhaltene Mittel ganz order teilweise zuruckgezahlt werden mussen, wenn ich die in der Forderungszusage genannten Verpflichtungen nicht einhalte und damit der Zweck der Forderung verfehlt wird. Nach erneuter Absprache mit meinen deutschen Fachkollegen beginnt der 2-monatige Aufenthalt am 28.07.1997 in 26.09.1997. I.Bekman.

REPORT

of the research work in the frame of an DAAD fellowship by Prof. Dr. Igor N.Bekman, Chemical Faculty Moscow State University, Moscow, Russia

Duration of the stay: 2 months in 1997 (from 28-07-97 to 27-09-97)

Host institute: GSF-Forschungzentrum fur Umwelt und Gesundheit Institut fur Okologische Chemie, 85758, Oberschleisheim, prof. Dr.A.Kettrup

In addition FZK-Forshungzentrum fur Technik und Umwelt: Institute fur Technische Chemie, Bereich Chemisch-Physikalische, D-76021, Karsruhe, Dr.R.Stahl; GKSS-Forschungzentrum: Institute fur Chemie, Bereich Membrane Technik, Max-Planck Str., D-21502 Geestacht, Prof. Dr.K.W.Boddeker

Research topic: “New functional materials for treatment of industrial wastes: characterization of properties of planar sorbents and asymmetric gas separation membranes for the treatment of gaseous waste streams”.

The functional materials (adsorbents and membranes) to be tested were prepared by the applicant by the applicant at the MSU. The thermostability of adsorbents and membranes, and thermodesorption characteristics of the sorbents were determined by thermogravimetry (TG/DTG) coupled with gas evolution analysis (using mass spectrometry detectors) and DTA all available at the GSF-Institute for environmental chemistry (collaboration with Dr. G.Matuschek). The standard gas chromatography based method was used for testing adsorption of the tailored materials (collaboration with Dr.Petra Marth and PhD-Student Wu Shaohui). The technique for monitoring of volatile airborne substances was based on the adsorption on suitable solid sorbent and then analysis of volatiles by gas chromatography. Following methods were used: dynamically generated test gas, gas chromatography with frame ionization, and liquid desorption using different sorbents (3 solvents different polarity were used). The dynamic test gas was generated with stable concentration in the range of 0.2-1.8 mg/ml, with a known relative humidity in the range of 4-82%. Following parameters were determined: adsorption capacity (breakthrough time), heat of adsorption , desorption efficiency and storage stability at different conditions (parameters: temperature, concentration of the compounds, and humidity). The recommendation for the synthesis of new materials with requested properties was obtained. Different functional materials were tested: adsorbents (chemically treated basalt and active coal) in the form of fibres, tissue or felt, non-porous asymmetric gas separated membrane from polyviniltrimetylsilane, porous polyester filter and aerosol filter from active coal. The gas evolution of the following substances was studied: H20, CO2, SO2, H2S, volatile organic compounds (mass range from 16 to 200). Adsorption-thermodesorption characteristics of dichlormethan, toluene and butanol vapours were determined. The potential use of new sorbents, active filters and gas separation polymeric membranes foe cleaning industrial wastes from hazardous pollutants (gases and volatile organic contaminants) and for monitoring dioxins, furans, and ketones in workplace air was discussed with scientists at the GSF, FZK and GKSS. An updated scientific information in the above research field was obtained during the visit from the library of the GSF Zentrum. The results of the research work will be presented in of two publications in the international journals. The information obtained will be used in further research work as well as in the preparation of lectures on “Environment Chemistry” for students of MSU.

Acknowledgement: I wish to express my gratitude to Prof. A.Kettrup and his co-workers for their interest and support of my research work and to the DAAD for the financial support of the visit to the German research and to the DAAD for the financial support of the visit to the German research institutes. I.Bekman, 10.10.97.

Ernest Oppenheimer Memorial Trust
W.D.Wilson visiting fellowship awards

Universiteit van Stellenbosch, Instituut vir Polimeerwetenskap
University of Stellenbosch, Institute for Polymer Science
UNESCO Associated Center for Macromolecules and Materials
Ron D.Sanderson, director of Institute for Polymer Science Dmitry G. Bessarabov, Ph.D. Universitet van Stellebosch, Institute for Polymer Science, Hydrocarbons Separation and Electro-Separations group Project Leader, Stellenbosch, South Africa
Dear Prof.Bekman,
It is my pleasure to inform you have been awarded a W.D.Wilson visiting Fellowship (Ernest Oppenheimer Memorial Trust) You will need to cover all the travel, living and any other expenses from the Fellowship for a minimum of up to 6 months. Your first visit can be completed in March-May 1998. In this regard, I would like to invite you to visit first time the Institute for Polymer Science, University of Stellenbosch, South Africa, for a period up to six weeks in March-May 1998. During your visit you will participate in the research work in the field of membrane-based hybrid electrochemical separations. You will also take part in lecturing at the University of Stellenbosch on “Transport phenomena in heterogeneous polymeric systems”. Our Institute has got a status of the International UNESCO Assoc. Centre for Macromolecules and Materials for Rural Development. In this regard, I would also expect from you to play an active role in negotiations on possible education and scientific co-operation between the Moscow State University and University of Stellenbosch. Possible joint industrial research projects would also be discussed. Please use this letter as an official invitation to visit South Africa when applying for a South African visa at the R.S.A. Embassy in Moscow. Looking forward to seeing you in Stellenbosch. Prof. R.D. Sanderson, director. 9.12.1997.

MEMORANDUM OF INTENT FOR INTERNATIONAL COLLABORATION

Prof. Igor Beckman has been awarded a prestigious WD Wilson Visiting Fellowship by the Ernest Oppenheimer Memorial Trust, South Africa. As a part of his visit programme in South Africa, Prof. Beckman is working towards setting up and strengthening international collaboration in science and education between the MV Lomonosov Moscow State University, Russia, and the University of Stellenbosch, South Africa. The present memorandum serves to confirm that negotiations on the above matter have taken place. The South African party were represented by the UNESCO Associated Centre for Macromolecules and Materials (Institute for Polymer Science), University of Stellenbosch. The following direction for future collaboration have been identified: the exchange of study material and courses, exchange of students and researchers, joint research in the area of membrane technology and polymer science. The joint work could include performing experimental work, processing and interpretation of the results, writing up papers, and so forth.

During the next visit of Prof.Beckman to Stellenbosch, South Africa, within his programme sponsored by the Ernest Oppenheimer Trust, a detailed discussion of the plans will be organized. This will enable the identification of the specific steps towards the realization of the programme, as well as to finalise the organizational and financial aspects. Prof. Ron D.Sanderson, UNESCO Associated Centre for Macromolecules and Materials, Institute for Polymer Science, University of Stellenbosch, 5.05.1998

Ron D.Sanderson, director of Institute for Polymer Science

Mr. Paul Hollesen, The Ernest Oppenheimer Memorial Trust, PO Box 61593, MARSHALLTOWN 2107 /9/97

REPORT BACK-WD WILSON VISITING FELLOWSHIP – PROF. I.BECKMAN

The Institute for Polymer Science, as a part of the University of Stellenbosch, was most fortunate to have Prof. I.Beckman from the Chemical Department of the Moscow State University at Stellenbosch on three occasions during the period from 1998 to 2000. The was made possible due to support of the Ernest Oppenheimer Trust which granted Prof. Beckman a WD Wilson Visiting Fellowship. Due to the continuous support provided by the Ernest Oppenheimer Trust and consecutive visits to the Institute for Polymer Science (IPS) by top Russian scientists, namely Prof. SF Timashev (a recipient of the same fellowship in 1996) and Prof. I.Beckman (a recipient of 1998), the research activities at the IPS were given a boost. Prof. Beckman, a highly rates scientists in Russia, has close links with not only academic research institutions but also with higher educational organizations. His vast teaching expertise was of enormous help on many occasions when he participated and played a key role in scientific discussions with students, seminars with researchers, including those of the National Acceleration Centre. He took part in examination of an M.Sc. thesis of Miss Wynova Michaels and, by actively critising, contributed to the improvement of the thesis. Within a recent agreement on scientific cooperation between South Africa and Russia, Prof. Beckman suggested that the Moscow State University could play a key role in developing links between higher educational institutions of the two countries. In particular, he proposed to set up an international physical chemistry course using software developed by MathSoft Inc. The course could be simultaneously used both in SA and Russia. Dr. D. Bessarabov, Chemistry Department of the University of Stellenbosch, has agreed to participate and lead the work. Becides the teaching activities, Prof. Beckman actively contributed to the research work conducted at the University of Stellenbosch. Being a specialist in the field of mass transfer in membranes, Prof. Beckman has proposed a number of mathematical models of membrane separations of gases and vapours, the latter being valuable products of SASOL industries. An experimental validation of the models was carried out at the IPS. In particular, a scientific paper by DG Bessarabov et al., which demonstrated a possibility of highly efficient n-hexane/1-hexene separations, was published in 1999. (The separation factor achieved was 200). During the visit by Prof. Beckman to the IPS, articles related to the improvement of the mathematical concepts presented by Dr. DG Bessarabov in his Ph.D. thesis in 1996, were published.

In order to make the information accessible to a wider audience, a decision was made to publish the articles in a bilingual (Russian/English) journal, namely, Moscow University Chemistry Bulletin. In particular, the following articles were published:

1. I.N.Beckman, D.G.Bessarabov, R.D.Sanderson “Integrated membrane systems with moving liquid carrier”, Moscow University Chemistry Bulletin (Russian/English), 1999, 40 (6) 408-413.

2. I.N.Beckman, D.G.Bessarabov, D.D.Sanderson “Diffusion processes in the absorption module of a membrane contactor”, Moscow University Chemistry Bulletin (Russian/English), 1999, 40 (6) 408-413

3. I.N.Beckman, D.G.Bessarabov, D.D.Sanderson “Separation a gaseous mixture in the absorption module of a membrane contactor”, Moscow University Chemistry Bulletin (Russian/English), 1999, 40 (6) 408-413

As a part of Prof. Beckman’s activities at the IPS, theory of emanation-thermal analysis was presented at seminars. As result, a short joint research was carried out. It success was achieved due the combination of thr expertise of the IPS in polymers and that of Prof. Beckman in radiochemistry. Results of the research were presented at the 6th International Conference on Nuclear Microprobe Technology and Application at Stellenbosch, SA, in 1998. The title of the presentation was “Ion implantation of radionuclides and thermodesorption spectroscopy for characterization of new materials” by I.N.Beckman, D.G.Bessarabov, R.D.Sanderson. The WD Wilson Visiting Fellowship is a cementing force in the establishing of an internationally recognized scientific structure aiming at research in the field of material science. More

importantly, it has helped to structure a growing relationship between Russia and South Africa in areas of nutual interest. Thanks to the Oppenheimer Trust two kings of Russian science and technology visited and worked at Stellenbosch University. We have another candidate in mind and sincerely hope for the continuous support by the Ernest Oppenheimer Memorial Trust in the future. Many thanks again to the Trust for a truly beneficial fellowship award. Yours sincerely, Prof. RD Sanderson, 29.02.2000

NATO SCIENCE FELLOWSHIPS PROGRAMME

National Agency CENTER FOR HIGHER EDUCATION STUDIES

Czech National Agency Prague

Total duration of the fellowship: 12 months in the period 1.06. 2000 - 31. 05. 2001

Title of the project: DIAGNOSTICS AND USE OF ECOLOGICAL MATERIALS

Name and affiliation of the developer: Igor N. Bekman Department of Chemistry, M. V. Lomonosov Moscow State University, Russia

Host institution: Nuclear Research Institute, Czech Republic

Approval by the host institute: Doc. RNDr. Vladimir Balek, DrSc.

RNDr. Zdenek Malek, CSc. Head of the NRI Central analytical laboratory

Dear Prof.Bekman,

I have the pleasure to announce you that the selection board within the famework of the NATO Science Fellowships Programme decided to award your requested fellowship 6600 EUR for year 2000, 600 EUR for travel expenses and 6000 EUR for living expenses. Within a few weeks you will receive a constant for awarded money containing all information you might need. Yours sincerely. Dr. Jan Lachman, National Administrator NATO Science Fellowships Programme.

Research programme:

Special attention will be paid to the further development of diffusion structural analysis [DSA] for characterization of microstructure changes in solids and the use of the DSA in following research topics:

1. Design and testing of new materials for treatment of hazardous waste of chemical industry – e.g. pillared montmorillonite or planar sorbent based on porous basalt fibres and charcoal fibres.

2. Determination of optimized conditions of the regeneration of sorbents.

3. Testing of glassy and ceramic matrices for encapsulation of hazardous waste, namely heavy metals and radioactive waste.

4. Use of diffusion structural analysis for characterization of tailored inorganic materials (e.g. advanced photocatalysts) based on TiO2-RuO2 oxides.

5. Mathematical modeling of the processes taking place during thermal treatment of the investigated materials, evaluation of results of Diffusuonal Structural Analysis and other methods used (differential thermal analysis, thermogravimetry, etc).

6. Recommendation for the manufacture and use of the advanced materials investigated by means of DSA and other methods.

7. Preparation of the documentation, scientific publication and chapter for the monograph to be published by international editors.

NUCLEAR THREAT INITIATIVE, NT

Nuclear Threat Initiative, NTI, Foundation program – 2004

I.N.Beckman/CERAMICS FOR NUCLEAR WASTE DiSPOSAL/ Gordon Research Conferences High Temperature Materials, Processes & Diagnostics/August 1 – 6, 2004, Colby College, Waterville, ME, USA

Dear Professor Bekman,

I am pleased to inform you that Gordon Research Conferences will support your participation in the High Temperature Materials, Processes and Diagnostics Gordon Conference through a grant

from the Nuclear Threat Initiative (NTI) Foundation program. We will support your Conference fee and the economy-class travel associated with your attendance at this meeting. We look forward to your participation in this meeting. Please do not hesitate to contact me with any questions or concerns you may have. With Warm Regards, Holly Tobin

Dear Prof. Bekman!

I have received your letter. It's good to know that you will be able to attend the High Temperature Materials, Processes & Diagnostics GRC and that have been invited to visit Prof. Andrew Teplyakov at his lab at the University of Delaware. As you may know, your planned visit with your colleagues is exactly the type networking opportunity that the Nuclear Threat Initiative (NTI) program encourages. As such, Gordon Research will support your visit to Prof. Teplyakov's lab at the University of Delaware through our grant from the NTI. We will pay for your economy-class travel to the conference site in Maine and then to Newark, Delaware.

Dear Holy Tobin,

Many thanks indeed for your kind invitation to the Gordon Research Conference on High Temperature Materials, Processes and Diagnostics, Aug. 1-6, Colby College, ME that I accept with great pleasure. I hope to obtain financial support for my travel to the conference from the Nuclear Threat Initiative Foundation program. I consider that this will provide an excellent opportunity for the world's eminent to meet and discuss the many problems of material science both on a national and international level. I would personally like to participate in the section: THERMODYNAMIC AND KINETIC MEASUREMENTS. If it is necessary, I can present the poster: Ceramics for Nuclear Waste Disposal. I would look forward to receiving the original copy of the officially invitation by post. Federal Express: M.V. Lomonosov Moscow State University, Department of Chemistry, Radiochemistry division, Leninskie Gory, 119899 GSP-3, Moscow, Russia Federation It will be a pleasure to have a reply from you. With kindest regards Yours sincerely, Igor N. Beckman