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UNITED NATIONS INDUSTRIAL ORGANIZATION

PROJECT PROPOSAL

PART A - BASIC DATA

| | | |
|---|---|---|
| COUNTRY | : | Korea/Czechoslovakia |
| PROJECT NUMBER | : | |
| PROJECT TITLE | : | "Synthesis and characterization of conducting/optically-active polymers" Twinning Agreement between the Korea Research Institute of Chemical Technology (KRICT), Daejeon, Korea and Institute of Macromolecular Chemistry (IMC), Czechoslovakia. |
| SCHEDULED START | : | Sept., 1990 |
| SCHEDULED COMPLETION | : | Dec., 1991 |
| ORIGIN AND DATE OF OFFICIAL REQUEST | : | KRICT and IMC |
| GOVERNMENT COUNTERPART AGENCIES | : | |
| UNIDO CONTRIBUTION | : | US $ 30,000 |
| GOVERNMENT CONTRIBUTION | : | Korea (US $ 20,000) and Czechoslovakia (US $ 1,500) |
| CURRENCY REQUIRED FOR | | |
| UNIDO INPUT | : | US $ 30,000 |
| CONVERTIBLE | : | |
| OTHER | : | |
| UNIDO SUBSTANTIVE BACK-STOPPING SECTION | : | |
| PROGRAMME COMPONENT CODE | : | |
| PROPOSAL SUBMITTED BY | : | KRICT and IMC |
| DATE OF SUBMISSION | : | |

PART B - NARRATIVE

## 1. Background and Justification

The importance of organic compounds as electronically (electrically) and optically active media goes on increasing. Polymers are materials potentially useful in a number of applications, both classical (piezoelectrical and pyroelectrical detectors, photodetectors, chemical and biological sensors, antistatics, and the like) and nonconventional ones, e.g. in molecular electronic devices. Therefore, chemistry of organic compounds and the investigation of their physical properties deserve increased attention. The great variability of the chemical structure of organic compounds allows molecules and functionally organized molecular assemblies to be prepared which possess properties required in advance ("chemical tailoring and molecular engineering"). e.g., polymers containing conjugated double and triple bonds often have semiconductive metallic character, many are photoconductive, with nonlinear effects observed in strong external fields, in other conformational changes of molecules occur in the excited state, etc. It is therefore desirable to prepare new types of low molecular compounds, polymers and molecular assemblies, in which interesting electron phenomena can be anticipated, to characterize their properties and to investigate the basic electronic processes involved.

IMC team has been studied on synthesis of polyacetylenes, substituted polyacetylenes, radical salts on the basis of pyridinium, photoconductive organic materials, electrochemical polymerization. Preparation of Langmuir-Blodgett films. Study of electrical and optical properties, molecular and electronic structure.

On the other hand, KRICT team has conducted the following works.

- Electrochemical Syn. of polytetrahydrofuran-polypyrrole composite and determination of characteristics as an electrode.
- Electrochemical Syn. of bridged poly ($\alpha$, W-alkyl) thiophene.
- Syn. of polyazomethines: preparation of liquid crystals having large optical nonlinearties (side chain liquid crystals containing dye molecules)

With the above-mentioned research experiences, we believe we are in a position to lay a basis for establishment of bilateral interest to co-operate, to share experience between the KRICT and IMC in the field of molecular electronics.

## 2. Special Consideration

With the establishment of bilateral co-operation on the basis of sharing experience in industrialization and technology and know-how between KRICT and IMC, acceleration of the research results could be achieved and the duplication work will be avoided.

## 3. Objectives

The main objective of this project is to find and characterize new conductive or optically active polymers which are to be used as key materials for the high technology product, with particular attentions being paid to following aspects:

- Development of the technology for preparation of thin, good optical quality films;
- Investigation of electric, photoelectric and optical (namely non-linear) properties of organic thin films.

- Investigation of mechanisms of the photoconductivity of polymers, especially of the photogeneration and photoinjection of charge carriers.
- Evaluation of photochromic compounds, like dihydropyridines, as potential materials for molecular optical memories.
- Study of non-linear optical properties, i.e. namely the generation of the second and third harmonics, on different types of materials;

## 4. Project Outputs

It is expected that through the implementation of this project, both Institutes will increase their knowledge in the field of electronic properties of organic solids and will prepare the basis for possible applications in electronics, like sensors, photodetectors, molecular memories, etc.

Not only the synthesis of new conductive structures and non-linear optical materials as expected, but explanation of involved physical mechanisms will also be benefitial for the future research of similar kind.

## 5. Project Activities

In order to facilitate the attainment of the main objective of the project, both institutes, on the basis of the time schedule of the project inputs and all activities, will exchange researchers, train researchers, and organize a symposium and perform advisory services. Joint publications or patents are also possible.

6. Project Input

UNIDO will provide US $ 30,000 for the period Sept. 1990- Dec..1991 in convertible currency and equivalent of US$ 21,500 in local con-convertible currency will be provided by the countries concerned (Korea: US $ 20,000 Won and Czechoslovakia: US $ 1,500 CSK).

7. Evaluation Plan

The project will be evaluated during the implementation and upon completion by the NGOs, Business and Industrial Institutions Co-operation Section and PDES with participation of the representatives from KRICT and IMC.

8. Envisaged Follow-up

The first phase of this three-year project will end in Dec., 1991. In the light of research outcome gained during this period, a long-term follow-up project can be submitted to the NGOs. Business and Industrial Institutions Co-operation Section, and PDES.

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PART C - CLEARANCE AND APPROVAL

Cleared by: Date:

Date:

Approved by: Date:

Amount approved Convertible Currency: Source of Funds:

Other: Date PAD requested:

ANNEX 1

WORKING PLAN Septemper 1990/Dec., 1991

| | Duration | Date |
|---|---|---|
| 1. Start-up and discussion meeting of the details of the cooperation at KRICT | 1x7 days | October 1990 |
| 2. Meetings on the management level will be held alternatively in both countries to evaluate the results and to prepare the plan and budget for the next year. The first one will be held in Prague. | 3x10days | January 1991 |
| The second meeting will be held in Daejon | 2x10days | March 1992 |
| 3. Training Korean scientists will be trained in the synthesis of electrically and optically active polymers and the characterization of their electrical and optical properties | 2x3months | May 1991 |
| Czechoslovak scientists will be trained in the study of the electronic properties of organics systems and electro polymerization | 2x3months | May 1991 |
| 4. Exchange of technical publications and samples | | continuously |

ANNEX 2

FINNANCIAL CONTRIBUTION OF CZECHOSLOVAKIA
TO THE WORKING PLAN SEPTEMBER 1990/Dec. 1991

( in Czechoslovak crowns, CSK )

| | | |
|---|---|---|
| Expert Component | | |
| Daily subsistence composed from daily allowance and accommodation for 1 Korean manager and 2 scientists participating in the annual meeting | 3 x 10 days | 15,000 CSK |
| Symposium Component | | |
| Daily subsistence composed from daily allowance, accommodation and conference fee for 1 Korean scientist participating on the IUPAC symposium in Prague | 1 x 6 days | 5,000 CSK |
| Training Component | | |
| Daily subsistence composed from daily allowance and accommodation for for 2 Korean scientists | 2 x 3 months | 90,000 CSK |
| Allocation to cover additional traning costs, e.g. local travelling, local symposia fee, etc. | | 5,000 CSK |
| Miscellaneous | | 1,000 CSK |
| TOTAL | | 116,000 CSK |

ANNEX 3

FINANCIAL CONTRIBUTION OF KOREA
TO THE WORKING PLAN SEPTEMBER 1990/Dec. 1991

( in Won )

| | |
|---|---|
| Export component | |
| Daily subsistence composed from daily allowance and accommodation for 1 Czechoslovak manager participating in the cooperation meeting | 1 x 10 days |
| Training component | |
| Daily subsistence composed from daily allowance and accommodation for 2 Czechoslovak scientists | 2 x 3 months |
| Daily subsistence composed from daily allowance and accommodation for 1 Czechoslovak manager and 2 scientists participating in the annual meeting | 3 x 10 days |
| Miscellaneous | |
| TOTAL | 14,800,000 Won |

ANNEX 4

FINANCIAL CONTRIBUTION OF UNIDO
TO THE WORKING PLAN SEPTEMBER 1990/ Dec. 1991

( in US dollars, USD )

Expert component
Ticket for 1 Czechoslovak expert to discuss
details of the cooperation
Okazaki (Japan) - Daejeon - Prague
October 1990

Round trip tickets for 3 Korean experts
participating in the annual meeting in Czechoslovakia
Daejeon - Prague - Daejeon

Round trip tickets for 3 Czechoslovak experts
to participate in the annual meeting in Korea
Prague - Daejeon - Prague

Training component
Round trip tickets for 2 Korean scientists
who has to be trained in Czechoslovakia
at the IMC (assumed at 1991)
Daejeon - Prague - Daejeon

Round trip tickets for 2 Czechoslovak
scientists who has to be trained in Korea
Prague - Daejeon - Prague

Symposium component

Round trip tickets for 1 Korean p[illegible]icipant
on the IUPAC Symposium in Prague
Daejeon - Prague - Daejeon

Round trip tickets for 2 Korean [illegible]icipants on the
Symposium on Molecular Electronic[illegible] USA (1991)
Daejeon - - Daejeon

Round trip tickets for 3 Czechos[illegible] participant on
the Symposium on Molecular Elec[illegible]s in USA (1991)
Prague - - Prague

Symposium fee, daily allowance a[illegible]ccommodation
for 5 participants during 5 days

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TOTAL USD 30,000