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OCCASION

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TF/G.50100/105
C.2000/061

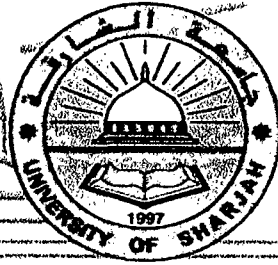


22702



International Centre for Science and High Technology
UNITED NATIONS INDUSTRIAL DEVELOPMENT
ORGANIZATION

Jointly organized by IC& UNIDO and University of Sharjah



Workshop On

Plastic & the Environment
20-24 March 2000

Plastic Waste Management;
Biorecycling & Recycling

ورشة عمل

المواد البلاستيكية والبيئة

٢٠-٢٤ مارس ٢٠٠٠

FINAL REPORT



Objectives:

The main objectives of the workshop were as follows:

- To provide participants from the local UAE industries and establishments, the rest of the GCC sub-regional countries and other developing countries with updated knowledge and information on recently introduced and currently developed technologies in fields related to degradable plastics.
- To update the scientific and technological knowledge of the participants in terms of the waste management of polymeric materials and to stimulate planning for the minimization of waste generation.
- To raise industrial, academic and public perception on the issues associated with the environmental effects of plastic, and to emphasize the positive contributions that manufacturing industries can make including the increased utilization of environmentally degradable polymers (EDPs)
- To stimulate international research and technology transfer and enhance international co-operation through executing:
 - Joint pilot projects.*
 - Follow-up workshops and seminars.*
 - Feasible R&D activities.*
- To assess the feasibility of establishing a focal point at one of the GCC countries to take care of data collection and data dissemination concerning the current evolution in the plastics industry.

Dates and Venue:

The workshop was held from 20 to 24 March 2000 in Sharjah, U.A.E. at the University Administration Building, with one half day (22 March) dedicated to a visit to local plastic companies.

Organization:

The workshop was jointly organized by the International Center for Science and High Technology (ICS) and the University of Sharjah (UOS), U.A.E.

Opening Ceremony:

The workshop was organized under the patronage of His Highness Sheikh Sultan Bin Mohamed Bin Sultan Al-Qassmi, the Crown Prince of Sharjah and inaugurated by Sheikh Abdalla Bin Salim Al-Qassimi, Head of the Sharjah Emiri Dewan who delivered a welcoming speech to the participants.

The opening ceremony was also attended by several invited guests plus the participants and important UOS officials.

Three opening speeches were also delivered by Prof. Isam Zabalawi, Chancellor of the UOS, Prof. Stanislav Miertus, ICS – UNIDO Area Coordinator and Dr. Abdalla Alnajjar, Director of the UOS Research & Studies Center.

Local Organization Committee:

Dr. Abdallah Alnajjar	Chairman of Organizing Committee
Dr. Nabil Kallas	Co-Chairman of Organizing Committee
Prof. Hafid T. Alhafid	Member
Dr. Ideisan Abu-Abdoun	Member
Dr. Khalil Elsaadi	Member
Dr. Adanan Basmma	Member
Mr. Majid Al-Jarwan	Member

Participation:

More than 300 application forms and invitation letters were distributed to most of the academic institutions and industrial companies in the region and neighboring countries. A leaflet was also circulated. In addition, the workshop was also advertised on the internet and local daily newspapers.

In total 69 persons attended the workshop. This number includes the attendees and the lecturers.

Eight main speakers (table – 1) from different institutions and countries have presented lectures covering different aspects of polymer degradation, stability, plastic recycling, state of the art of environmentally degradable polymers and their applications, legal aspects and solid waste management with special emphasis on plastic waste. Most Lecturers have also presented the experience of their own countries in the management of plastic waste. Some have presented samples of new products prepared from EDPs.

Table – 1. Main Lecturers of the Workshop

Lecturer	Institution	Country
S. Miertus	International Centre for Science and High Technology	Italy
E. Chiellini	Department of Industrial Chemistry University of Pisa	Italy
R. Narayan	Bioplastics Inc., Michigan	USA
G. Scott	University of Aston – Birmingham	UK
I. Chodak	Polymer Inst., Slovak Academy of Science	Slovakia
G. Braunegg	Institute of Biotechnology, University of Technology, Graz	Austria
S. Kandil	Institute of Postgraduate Studies and Research, Alexandria University	Egypt
E. Piskin	Hacettepe University	Turkey

60 participants (Table – 2) from 7 countries regularly attended the workshop.

Table – 2. Participants According to Countries

Country	No. of participants
Qatar	3
Saudi Arabia	1
Iraq	1
Egypt	7
Nepal	1
Turkey	1
United Arab Emirates	46

The complete list of participants is attached. (Appendix-I)

Workshop Materials:

Each participant and lecturer was provided with the workshop package in addition to some complimentary gifts, postcards and information booklets about the country, The main workshop materials are:

- Book of Abstracts.
- Scientific Program.
- List of all participants with their addresses.
- Book of Handouts (Copies distributed during the event and a book published two weeks after)

Scientific Program:

The workshop scientific program, which is given in full in appendix II, was spread over five working days, May 20th – May 24th. The program also included the social events that accompanied the workshop.

Lectures were delivered through four daily sessions from 9:30 am till 5:00 pm, with an average of 3 presentations in each session. Time duration for each presentation ranged from 40 to 50 minutes. Each presentation was followed by a few minutes of discussion.

The 1st Technical Session held on March 20, was started with an overview given by Prof. Miertus on the principles and goals at the core of the ICS-UNIDO program on Environmentally Degradable Plastics. On the same line, the further contribution by Prof. Chiellini and Prof. Narayan, provided a complementary overview of the major issues related to the plastic waste management in relation to their increasing world-wide production and consumption. New concepts and avenues were presented for the design of polymeric materials intended to provide items ecocompatible and in keeping with a sustainable industrial development.

The 2nd Session of the day was dedicated to the illustration of the principles of photo-degradation and design of photo-degradable polymers. The session enjoyed also the

presentation given by Dr. Alnajjar of the University of Sharjah and future perspectives in the establishment of a Research Center for Science Research and Technology Development.

Professor Chiellini closed the session by summarizing the major points brought to the attention of the audience during the day and by coordinating further discussions.

The second day of the Workshop comprised three technical sessions touching respectively: non-conventional ways to prepare biodegradable polymers by biotechnological procedures (microbial polymerization) using feed-stock of natural origin and fossil fuel. The contribution given by Prof. Braunegg was complemented by the contribution given by Prof. Chodak on the various options for the processing of microbial polyesters and blends and composites (Session 3).

Issues relevant to testing protocols, standards and relative guideline including the fate of metabolites from biodegradable polymers were thoroughly analyzed by Prof. Scott and Prof. Narayan. The presentations generated a lot of discussion and interest on the part of the participants (Session 4).

The final part of the day (Session 5) was dedicated to three presentations that in some extent could be quoted as Case Studies that focused respectively on Biodegradable Polymers in Biomedical Applications (Prof. Piskin), Utilization Of Waste Gelatin For The Formulation Of Self Fertilizing Mulching Films (Prof. Kenawy) and on the follow-up actions undertaken within the ICS-UNIDO program relevant to EDPs started in December 1996 (Prof. Miertus)

At the end of the day, after the summary of the major points highlighted during the various presentations given by Prof. Chiellini, an extensive discussion was dedicated to all the presentations with particular emphasis on standards and testing protocols for EDPs.

The third day of the Workshop was dedicated to a visit during the morning to manufacturing companies located in Dubai industrial area. The business activities of the companies respectively focused on the manufacturing of door & window frames from PVC profiles, commingled recycling of plastic waste (mostly from industrial scraps) and paper recycling.

The afternoon session (Session 6) was dedicated to the presentation of a case study concerning the recycling of tyres (Prof. Akelah) and to a country report relevant to Plastic Industries in the UAE (Prof. Abdoun). Prof. Chiellini closed the session after an intensive discussion regarding the impressions reported from the morning visit to the companies and on the two presentations of the afternoon.

The 4th day of the workshop was opened by a comprehensive presentation provided by Prof. Kandil on the various options offered by recycling of plastic waste including a neat thermodynamic and economic balance. The Technical Session 7 was closed by the presentation given by a manager in a Petrochemical Company (ADNOC) located in Abu Dhabi (Dr. Akbar).

The Technical Session 8, consisted of seven contributions focused on country reports by different countries including Egypt, Turkey, Qatar, Slovakia and Austria. The technical session was closed by the presentation of an Abu-Dhabi located company interested in developing in UAE of a Company (SPI) for the production of Environmentally Degradable Plastics, particularly suited for the Middle East countries.

Assessment:

Assessment of the workshop was performed through an optional questionnaire distributed to participants. A summary of this assessment is given in table -3 . According to the result of this assessment the workshop was very successful and the organization was excellent, most evaluations have ranged from very good to excellent.

Most participants consider the information process, applied lectures, case studies, time of lectures, lecture room, breaks and refreshment, organizer response to participants' needs and the overall program organization as excellent. Most of the participants considered the announcement and the pre-workshop materials, the scientific program, hotel accommodation and the hotel meals very good.

The question of working groups have not been answered by many participants due to the fact that this question is not very relevant to a workshop but more suitable for a training course. All Participants would recommend others to attend a similar activity. Most participants considered the topics discussed as very useful and important for industries and municipalities and for all groups concerned with environment conservation since solving the problems associated with plastics waste was very well addressed. Some have suggested including more visits to industrial sites. Finally several participants have recommended an earlier announcement for any similar activity so as to give time for better presentations and for collecting the necessary information.

Table – 3. Summary of the questionnaire

A. Organization	Excellent (%)	Very good (%)	Good (%)	Fair (%)	Remarks
Information Process	54	31	15	---	
Announcement	30	54	16	---	
Scientific Program	71	22	7	---	
Applied lectures	38	46	16	---	
Small working groups	11	22	22	45	
Case studies	56	22	22	---	
Time of lectures	60	30	10	---	

B. Duration of program	Just Right %	Too long %	Too short %
No. of days	86	14	---
Length of working days	86	7	7

C. Training Facilities & Hotel	Excellent %	Very good %	Good %	Fair %	Comments
Lecture/Training room	100	---	---	---	
Breaks/Refreshment	100	---	---	---	
Hotel accommodation	91	---	9	---	
Meals at the hotel	83	17	---	---	

D. Organizer Response	71	29	---	---	
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E. Overall organization	65	35	---	---	
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F. Would you recommend others to attend similar activities in the future	Yes %	May be %	No %
	92	8	0.0

G. Evaluation of scientific Materials and Lectures	Excellent %	Very good %	Good %	Fair %	Comments
Course materials	57	36	7	---	
Resident lecture presentations	50	42	8	---	
International lecture presentations	57	36	7	---	
Ability of lecturers to answer questions	64	29	---	7	

Closing Ceremony:

The closing ceremony session started at 15.10, March 23rd and was chaired by Dr. Abdalla Alnajjar and Prof. Emo Chiellini.

Professor Miertus presented a general overview on how ICS used, in the last two years, to follow up these activities through:

- Follow-up seminars which could be on general or more specialized aspects
- Publishing of proceedings
- Establishing a regional network connected to ICS – UNIDO network and data base for collecting updated information on EDPs, plastic waste management ... etc.
- Identifying experts and institutions working in the field

He also explained that possible project proposals could be within any of the following topics:

- Technology transfer of new materials (e.g. EDPs), from industrialized to developing countries.
- Joint research projects
- Feasibility studies
- Programs evaluation.
- Consultancy and Technology evaluation

Then there was a general discussion among several participants in which there were several contributions and suggestions (please see the paragraph on conclusions and general remarks).

After that Professor Chiellini presented his final remarks and notes in which he answered several technical questions raised, especially those associated with EDPs and their future prospects. He explained that it is not the policy of ICS-UNIDO to oppose the development of the more sustainable plastics as might be thought, EDPs are not the alternative for all polymers, they constitute an alternative in certain sectors of plastic utilization; and an option, coexisting with others available, for the management of plastic waste.

Final Evaluation and Recommendations:

The workshop was successful and has achieved its objectives. This can be shown from the assessment of the participants, the discussion and the final conclusive remarks and the acknowledgement letters received from various lecturers and participants.

A greater concern and awareness of the environmental issues associated with plastic consumption and applications have been raised, EDPs and their possible applications are more understood, perception has been improved on certain environmental issues such as recycling and other options of waste management. Updated information on the latest technologies in the field has been exchanged between researchers, industrialists and environmentalists from nineteen countries. A regional network and proposals for future projects are being discussed.

The main conclusions from the UOS perspective that were agreed upon by the participants can be summarized as follows:

- There is a serious need to identify a willing academic or R&D institution within the GCC sub-region to be recognized and allowed to develop as a main focal point for data collection, data dissemination and advisory and consultancy services for new plastic materials. Some of the participants indicated their hope that the UOS seize up this opportunity and develop the infrastructure needed to meet this recommendation.
- There is great need for national UAE standards in almost all industrial aspects including the plastic industries. It is thought that UOS and other academic institutions in the region should play an important role to attain this objective.
- Universities and R&D centers in the area must have direct involvement in developing their local communities through various means and measures including the execution of pilot projects in collaboration with other local and international bodies.

Budget:

The two parties : the UOS and ICS-UNIDO, have agreed to financially support the workshop.

The details of the final expenditure for the workshop is as follows :

	<u>Sub total Dhs.</u>	<u>TotalDhs.</u>	<u>U.S. \$</u>
<u>1-hotels & Catering</u>			
A.Hotels:			
Holiday Intl. Sharjah	40104.8		
B.Catering			
Holiday	20510		
Albert Abela Co. shj	4145		
Al Samadi Sweets	850		
	<u>25505</u>		
		65609.8	
<u>2-Air tickets & Visa Expenses</u>			
A. Air tickets reimbursement	37551		
B. Visa issuing expenses:			
19 No. Transit visa @ 120Dhs	2280		
3 Nos. Visit visa @ 100 Dhs.	300		
	<u>2580</u>		
		40131	
<u>3-Salaries</u>			
Part time jobs	19500		
		19500	
<u>4-A. Advertisement and stationery</u>			
A. Advertisement	6256		
B. Stationery	5152		
	<u>11408</u>		
		11408	
<u>5-Communication & Correspondence</u>			
A.telephon & fax	10120		
B.mail	1729.6		
	11849.6		
		11849.6	
<u>6-Transportation</u>			
cars & buses	3280		
		3280	
<u>7-Translation</u>			
Translator	5520		
		5520	
<u>8- Other Expenses</u>			
A.Printing and photocopying	5515		
B. miscellaneous expenses	1878.4		
	<u>7393.4</u>		
Grand total expenses		<u>164691.8</u>	<u>44833.61</u>
<u>Less:</u>			
UNIDO Sharing as per contract No.:2000/061			
Advance payment as upon signature of contract			
U.S.\$ 17500@3.6734	64284.5		
Upon the final report (to be invoiced)			
U.S.\$ 4500@3.6734	<u>16530.3</u>		
		80814.8	
Net sharing of U.O.S		<u>83877/-</u>	<u>22833.61/-</u>

TABLE-1 : MAIN LECTURERS OF THE WORKSHOP

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TABLE-4 : PARTICIPANT FROM THE UOS

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International Workshop on "Plastics and the Environment"**March 20th –24th, 2000**

**INTERNATIONAL WORKSHOP
ICS-UNIDO and the UNIVERSITY OF SHARJAH
Sharjah – United Arab Emirates**

SCIENTIFIC PROGRAM**Sunday Evening, March 19th, 2000**

19:00 Reception
Venue Hotel Holiday International , Sharjah

Monday, March 20th, 2000**Opening Session**

08:30 *Bus leaves Hotel Holiday International to University of Sharjah*
09:00 Registration
09:30 - 10:00 Inauguration
10:00 - 10:30 Break

***Technical Session (1) ENVIRONMENTALLY DEGRADABLE PLASTICS
Chairman (Sherif Kandil)***

10:30 - 11:10 Goals and Programs of ICS-UNIDO,
Program of Environmentally Degradable Polymers.
Stansislav Miertus, ICS UNIDO Coordinator

11:10 - 11:50 Environmentally Degradable Polymers and Plastics: An Overview.
Emo Chiellini, Pisa University

11:50 - 12:30 The Life Thinking Approach : Designing Plastics to be Degradable.
Ramani Narayan, Michigan State University

12:30 - 13:30 Lunch Break

Technical Session (2) TOWARDS GREEN POLYMERS
Chairman (Emo Chiellini)

- 13:30 - 14:10 The Way to Green Polymers “Are All Bio-degradable Polymers Green”?
G. Scott, Birmingham University
- 14:15 – 14:55 Photodegradation, A Step Towards Green Polymers.
S. Kandil, Alexandria University
- 15:00 – 15:15 Break
- 15:15 – 15:45 Scientific and Applied Research Centre At Sharjah, The Way Ahead
Abdalla A. Alnajjar, University of Sharjah
- 15:45- 16:30 Discussion (E. Chiellini)
- 20:30 Dinner Party , Lou Lou’A Hotel - Sharjah

Tuesday, March 21, 2000

- 08:30 *Bus leaves Hotel Holiday International to University of Sharjah*

Technical Session (3) THE MAKING OF BIODEGRADABLE POLYMERS
Chairman (Erhan Piskin)

- 09:00 - 09:40 Sustainable Polyhydroxyalkanoate (PHA) Production.
G. Braunegg , Graz University
- 09:45 -10:25 Property Modification of Polyhydroxyalkanoates.
I. Chodak, Slovak Academy of Science
- 10:30 - 11:00 Break

Technical Session(4) TESTING AND STADARDS
Chairman (G. Braunegg)

- 11:00 – 11:40 Fate of Biodegradable Polymers and Testing Protocols.
G. Scott, Birmingham University
- 11:45 – 12:25 Biodegradable Plastics for Sustainable Technology Development and The Evolving World-Wide Standards.
R. Narayan, Michigan State University
- 12:30 – 13:30 Lunch

Technical Session(5) APPLICATIONS OF BIODEGRADABLE PLASTICS
Chairman (Ivan Chodak, Slovak Academy of Science)

- 13:30 – 14:10 Biodegradable Polymers for Medical Applications.
E. Piskin, Hacettepe University
- 14:15 – 14:55 **Environmentally Degradable Plastics From Waste Gelatin to Agro-Industrial Applications; A Case Study of ICS-UNIDO Follow-Up Policy.**
El-Refaie Kenawy, Tanta University
- 15:00 – 15:15 **Break**
- 15:15 – 15:55 *Follow up on ICS UNIDO Courses*
Stanislav Miertus, ICS UNIDO
- 16:00 – 16:30 *General Discussion*
(E. Chellini)

Wednesday, March 22nd, 2000

- 08:30 Bus leaves Hotel Holiday International
- 09:30 – 10:30 Life Plastic Factory – Dubai
Windows & Doors, Plastic Manufacturing
- 11:00 – 12:00 ECO Plastic Industries - Dubai
Plastic Recycling
- 12:00 – 12:30 Back to the University of Sharjah
- 12:30 – 13:30 Lunch

Technical Session (6) INDUSTRY IN THE UNITED ARAB EMIRATES
Chairman Nabil Kallas, University of Sharjah

- 13:30 -14:10 Aspects of Plastic Recycling.
S. Kandil, Alexandria University
- 14:15 - 14:55 Recycling of Scrap Tire Rubbers In Asphalt Paving Mixtures
A. Akelah, Tanta University
- 15:00 – 15:15 Break
- 15:15 - 15:55 Discussion (**E. Chiellini**)
- 19:00 Visit to Sharjah Heritage Site
- 20:30 Dinner Party, Heritage Site

Thursday, March 23, 2000

08:30 *Bus leaves Hotel Holiday International to University of Sharjah*

Technical Session (7) – PLASTIC RECYCLING
Chairman (Ramani Narayan, Michigan State University)

09:00 - 09:40 Plastics Industries in the U.A.E.: An Overview.
I. Abu-Abdoun, University of Sharjah

09:45 - 10:25 Petrochemicals at ADNOC, U.A.E.
A. Akbar, ADNOC

10:30 – 11:00 Break

Technical Session (8) – COUNTRY REPORTS
Chairman I Abu-Abdoun, University of Sharjah

11:00 - 11:30 Egypt : A Country Profile For Plastic Recycling (**E. Kenawy**), *Tanta*

11:30 - 12:00 Turkey : Plastic and Solid Waste Management in Turkey (**Hulya Yavuz**),
Hacettepe University

12:00 - 12:20 Qatar: Plastic Waste and Recycling in Qatar (**Ziad Said**), *Qatar University*

12:20 - 12:40 Doha: Domestic Waste Management in Qatar, Doha City (**Mohamed Anwari**), *University of Qatar*

12:40 – 13:40 Lunch

13:40 – 14:10 Slovakia; Solid Waste Management in Slovakia (**I. Chodak**), *Slovak Academy of Science*

14:10 – 14:30 Austria: Plastic Waste Management and Plastic Reuse in Austria (**G. Braunegg**), *Gratz University*

14:30 – 14:50 The Revolutionary New Degradable Plastic from SPI-Tek (**Michael Stephens**), *Symphony Environmental Ltd.*

14:50- 15:10 Break

Closing Session

15:10 - 15:30 Highlights and Conclusions of the Course (**Emo Chiellini**)

15:30 - 15:45 Wrapping-up and Panel Discussion (**S. Miertus**)

15:45 Handling of Certificates

FRIDAY, March 24, 2000

Session (9) – WRAP-UP
Chairman (Abdalla A. Alnajjar, UOS)

09:00 - 10:40

Organizational Review of the Proceedings and Activities of the Workshop.
Follow-up of Workshop Recommendations
Organizing Committee