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for Western Asia**

**REPORT OF THE EXPERT GROUP MEETING  
ON TECHNO-ECONOMIC ASPECTS OF  
THE COMMERCIAL APPLICATION OF NEW MATERIALS  
TECHNOLOGIES IN THE ESCWA COUNTRIES**

Al-Ain, United Arab Emirates  
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## I. INTRODUCTION

1. New materials technologies already constitute a sizeable area of activity in the world economy. The countries of the ESCWA region possess enormous oil resources which constitute primary materials for industrial activities based on several classes of new materials with applications in many sectors. Indeed, several ESCWA member countries, particularly in the Gulf region, already produce a variety of petrochemicals which constitute useful intermediates for a number of new materials.

2. ESCWA and the United Nations Industrial Development Organization (UNIDO), in cooperation with a number of international and regional organizations, held an expert group meeting, in September 1992, on the "Implications of New and Advanced Materials Technologies for the Economies of the ESCWA Countries". The meeting succeeded in highlighting the opportunities as well as the challenges posed by developments in new polymers, ceramics and composites for the economies of the ESCWA member countries. It also underscored the need for dealing in greater depth and detail with some of the aspects relating to the acquisition and commercial application of specific materials technologies. The expert group meeting which is the subject of this report was held in response to this need.

3. The expert group meeting was organized in cooperation with UNIDO and the Faculties of Science and Engineering at the United Arab Emirates University. The United Arab Emirates University hosted a number of senior participants in the meeting. Guided tours of the University's facilities were arranged for a number of participants.

4. A total of 38 participants took part in the meeting. Participants included representatives of research and development (R and D) centres, universities, prominent European firms active in new materials technologies, national investment institutions and national chambers of commerce and industry. Several participants, particularly those from Austria, Egypt, Germany, Italy, Qatar and Saudi Arabia, covered their own expenses.

5. The papers presented and discussed during the meeting's sessions numbered 24. Five of these presentations were made by contributors from European R and D centres of excellence, universities and industrial firms. The substantive contributions of the United Arab Emirates University included contributions by the deans of the faculties of Science, Engineering and Economic and Administrative Sciences. Nine papers were presented by national and regional institutions from the Gulf region, including the Gulf Organization for Industrial Consulting, the Research Institute of the King Fahd University for Petroleum and Minerals and the King Abdulaziz City for Science and Technology. The rest of the papers were presented by R and D centres, investment corporations and universities from Egypt, Jordan, the Syrian Arab Republic and Yemen. The meeting included special sessions designed to discuss business opportunities in new materials technologies. ESCWA and UNIDO presented one paper each.

## II. OBJECTIVES

6. The aims of the meeting were the following:

(a) Analysing the technological aspects of acquiring concrete capabilities in the selected new materials technologies and their commercial applications with emphasis on:

- (i) Polyolefins as well as polyolefin blends and alloys;
- (ii) Fibre-reinforced composite materials;

- (iii) Selected ceramics and cement-based materials;
- (iv) Plastics degradation and recycling;

(b) Assessing institutional and resource requirements for the commercial application of selected new materials technologies; including R and D, regulatory and standards bodies and information networks;

(c) Discussing modalities which may best be adopted in order to ensure profitable and environmentally sound commercial application of new materials technologies;

(d) Considering the role of private enterprise, trade federations and professional associations in promoting the commercial application of selected new materials technologies.

7. As requested by ESCWA, several contributions contained project profiles including essential information about investment activities involving the commercial applications of selected new materials.

### III. SUBSTANTIVE MATERIAL PRESENTED AND RESULTS ACHIEVED

8. Substantive contributions prepared by participants from ESCWA member countries as well as from the European institutions taking part were prepared on the basis of terms of reference provided by ESCWA. The guidelines with which the participants were provided were developed in consultation with UNIDO as well as the institutions and the principal authors concerned.

9. Drafts of the papers received from the participants were reviewed by ESCWA prior to being finalized by the authors so as to ensure adherence to the objectives of the expert group meeting.

10. Substantive contributions to the meeting fall into three categories:

(a) Contributions by consultants;

(b) Papers by participants;

(c) Presentations by the organizing bodies (ESCWA, UNIDO and the United Arab Emirates University).

11. Contributions in the first category emphasized the technological requirements in the various areas of new materials applications. The potential in areas such as the polyolefins and fibre-reinforced plastics was singled out for special attention. Possibilities offered by new processes were discussed, and their possible implications for industrial and technological developments in the region were highlighted.

12. Papers presented by the participants generally targeted specific application areas, and several contributions in this category actually presented project profiles addressing specific new materials activities. Presentations from Egypt focused on ceramics for industrial and biomedical applications. Presentations by Saudi Arabian research centres were concerned with both new materials based on the region's petrochemical resource base as well as developing the materials resources in specialized areas of glass and ceramics technologies. Presentations from Jordanian institutions were concerned with new membrane technologies for water treatment and with the degradation and recycling of polymers. Papers from Jordan and Yemen addressed construction materials, including cements and modified derivatives. Papers from Syrian institutions focused on optical glass technologies and glass-reinforced materials for industrial applications.

13. The presentations made by ESCWA, UNIDO and the United Arab Emirates University focused on the following policy, institutional and resource-related issues:

- (a) Analysis of the state of the art in the selected new materials technologies as well as an outline of the more significant recent and expected developments;
- (b) Technological and economic prerequisites for competitiveness in the application of the selected new materials technologies in specific areas;
- (c) The roles of the private sector in the manufacturing industries in the acquisition and in the utilization of the selected new materials technologies;
- (d) The need to upgrade auxiliary technological/manufacturing activities, including, among others, raw material production and processing, production equipment design, surface treatment processes and quality control methodologies;
- (e) The role of licensing in the acquisition of new materials technologies, particularly in relation to large manufacturing facilities in polyolefins and composites;
- (f) Research, development, design and engineering activities in new materials technologies with emphasis on R and D cooperation among concerned institutions in ESCWA member countries;
- (g) The raw materials situation in relation to the new materials addressed in the meeting, with particular emphasis on the raw materials most suitable/available for use in ESCWA member countries;
- (h) Aspects related to characterization, quality assurance, testing and standards, covering the relevant raw materials and products.

14. The studies, discussions and recommendations of the meeting complement one another and, in their entirety, constitute the basis for a solid plan of action for the acquisition and commercial application of new materials technologies in ESCWA member countries. The papers prepared for the meeting, together with its discussions, revealed the following concerns of the participants and the institutions they represented:

- (a) Compatibility of new materials technologies with environmental considerations and sustainable development efforts;
- (b) Encouraging downstream industries involving new materials;
- (c) Enhancing the role of non-governmental organizations, including trade and industry federations and concerned professional associations;
- (d) Industry/university R and D cooperation in materials science and technology;
- (e) Higher education and training in materials science and engineering;
- (f) Regional cooperation and enhancing the role of international and regional organizations in building capabilities in materials science and technology.

15. In relation to specific areas of new materials activities in ESCWA member countries, the following points were underlined:

(a) Certain member countries possess valuable resources which should enable them to enter and compete in several areas of technologies in engineering plastics, including polymer blends and alloys, composites and certain high-performance polymers;

(b) There is a need to integrate R and D, technology acquisition and marketing strategies in order to achieve optimal results from the expansion of existing and planned new materials activities in the region;

(c) Areas of downstream applications need to be further developed in order to create greater demand for new materials products and activities at the national and regional levels;

(d) Technology licensing and R and D cooperation with external technology holders should be exploited more fully in order to achieve optimal results;

(e) Technological development in areas of traditional materials, including polymer-modified and fibre-reinforced cements and mortars, can offer useful solutions to some of the problems facing the construction sector in ESCWA member countries. There is a need, however, for more R and D work with particular emphasis on standards and quality control procedures;

(f) Novel recycling methods, including feedstock recycling technologies, offer environmentally sound solutions only when economies of scale are attainable. The involvement of governmental and non-governmental institutions in promoting such technologies and in laying down standards and quality control procedures will support the dissemination of viable recycling practices;

(g) New ceramic materials in biomedical, automotive and mechanical engineering applications have already entered the materials scene and will have an important part to play in medical and industrial developments in the countries of the region. Special arrangements will have to be made for institutions in the region to enter these fields owing to their special requirements in terms of diagnostics and performance evaluation.

16. Building capabilities in the concerned institutions of the ESCWA member countries so as to make use of the advances made in new materials technologies will be the subject of a detailed study being prepared by ESCWA. Furthermore, the meeting documents and its discussions will be published in the first quarter of 1996.

17. The evaluation exercise conducted at the conclusion of the meeting revealed satisfaction with the organization of the meeting, the choice of topics and the outcome of its discussions. It also pointed to continued interest at several levels in ESCWA member countries in further developing capabilities in new materials.

#### IV. DISCUSSIONS HELD AT THE EXPERT GROUP MEETING

18. In view of the competitiveness and the consequent R and D intensiveness of new materials industries, discussions held at the meeting emphasized the need for greater cooperation among concerned institutions in ESCWA member countries. Discussions focused on the idea of creating a regional network of R and D and higher educational institutions, industrial enterprises, producers associations, trade federations and

professional bodies concerned with the development, dissemination and adaptation of new materials technologies and their applications.

19. The main functions of the network would be to coordinate the activities of the member institutions in:

- (a) Information gathering, dissemination and analysis regarding selected new materials technologies;
- (b) Training programmes for scientists and technologists in specific areas of new materials technologies;
- (c) Conducting economic analyses, market research and social/environmental impact assessments;
- (d) Monitoring the possibilities of new institutional mechanisms aimed at the promotion of new materials technologies, such as liaison bodies, teaching companies and business incubators.

20. It was envisaged that the network should have as its core institution a regional centre for materials R and D and training. Such a centre could ideally be housed in an existing institution in one of the ESCWA member countries, whose mandate is to carry out R and D and high-level training in areas of common interest to ESCWA member countries.

21. Discussions held at the meeting also centred on the need for the Governments of ESCWA member countries to consider the establishment of specialized institutions for R and D and training. Such institutions should act as nodal points in the above-mentioned network by focusing on specific new materials technologies that are compatible with each country's natural resource base and development plans.

22. Strengthening new materials R and D at the firm level was another subject for the meeting's discussions. The need to develop new methodologies in order to meet the needs of small and medium enterprises in new materials technologies was also emphasized at the meeting. Concerned governmental and non-governmental institutions in ESCWA member countries were urged to cooperate with regional and international organizations with a view to elaborating and implementing such methodologies.

23. The recommendations of the meeting, modified in the light of discussions held in the final session, are listed below.

## V. RECOMMENDATIONS OF THE EXPERT GROUP MEETING

### A. Preamble

24. Materials technologies exercise an increasingly invigorating effect on a wide variety of activities in the production and service sectors. In addition, they have been the source of numerous opportunities for upgrading technological capabilities in a variety of fields.

25. Member countries of the Economic and Social Commission for Western Asia (ESCWA) possess an important wealth of raw materials and industrial infrastructures on the strength of which significant new materials capabilities may be based. However, in order for such capabilities to have the desired long-lasting effects, it will be essential to formulate policies and introduce structural changes at the level of the government department, the firm, the R and D centre and the institute of higher education.

26. Novel mechanisms allowing for greater regional and international cooperation in materials science and technology, on the one hand, and stronger linkages between science and technology (S and T) institutions and production enterprises, on the other hand, will also have to be implemented.

27. Within this context, a regional meeting on the "Implications of New and Advanced Materials Technologies for the Economies of the ESCWA Countries" was organized in 1992 at the Higher Institute for Applied Science and Technology (HIASST) in Damascus in cooperation with the Arab School for Science and Technology (ASST), ESCWA and UNIDO as well as other organizations. The recommendations of these workshops included the following suggestions:

(a) That the current workshop be held to discuss specific issues pertaining to the commercial application of certain new materials technologies;

(b) That an Arab multidisciplinary materials research centre be established in the ESCWA member countries. A feasibility study has already been concluded through the joint efforts of UNIDO and HIASST.

28. Papers prepared for the current Expert Group Meeting on Techno-economic Aspects of New Materials Technologies in the ESCWA Countries as well as the discussions these papers generated at the meeting, formed the basis for the following recommendations which were unanimously adopted at the conclusion of the meeting.

## B. Policy issues

### 1. Science and technology policies

29. Commercial applications of new materials technologies will always depend on a multitude of other technologies for their viability. Thus, a new materials policy can succeed in achieving its aims only on the basis of a coherent S and T policy. Considering that several ESCWA member countries have not as yet formulated explicit and integrated S and T policies, the meeting urged all concerned institutions to formulate S and T policies emphasizing opportunities created by new materials technologies and their commercial applications in a manner that is compatible with the goals of sustainable development in ESCWA member countries.

30. Concerned industry federations and professional associations are urged to participate in the formulation of these policies since one of the main objectives of such policies will be to promote applications of new technologies, including new materials technologies in manufacturing activities.

### 2. Role of Governments

31. Governments of ESCWA member countries are urged to focus their efforts on the creation of environments that are conducive to R and D in new materials technology as well as acquisition and dissemination of such technology and the promotion of industries based on new materials.

32. Governments of ESCWA member countries are also urged to enhance their support for R and D centres and institutes of higher education so as to enable such institutions to contribute more effectively to the capabilities of ESCWA member countries in new materials technologies.

33. The adoption of standards and regulations and their proper enforcement thereof will play an important role in rationalizing the introduction and commercial applications of new materials technologies. Thus, the Governments of ESCWA member countries are urged to establish institutional arrangements and devise the necessary regulatory measures and incentives as well as enforcement procedures aimed at economically and environmentally sound applications of new materials technologies.

34. Most new materials industries in ESCWA member countries are still in the early stages of development. It will therefore be necessary for the Governments of the ESCWA member countries to support the implementation of new materials initiatives. Such initiatives should aim to achieve well-defined capabilities in new materials technologies in particular sectors, selected on the basis of a system of priorities that is compatible with national and regional sustainable development objectives.

### 3. Role of non-governmental organizations

35. Trade federations and professional associations in many of the industrialized countries play an important role in the promotion of materials technologies, including training, information dissemination and participation in establishing industry and consumer standards. Corresponding institutions in ESCWA member countries are urged to take up similar functions.

36. Small and medium-size enterprises (SMEs) in the liberal economic climate that is emerging can play an important role in the acquisition and commercial application of new materials technologies. However, their capacity for supporting R and D activities, gathering up-to-date information and acquiring advanced testing and quality control capabilities are limited. National chambers of commerce and industry, professional associations and regional trade and industry federations are therefore urged to assist SMEs in supporting their endeavours in new materials technology acquisition, development, dissemination and commercial application. Furthermore, the establishment of national and regional materials science and engineering societies—and support for existing ones—should be regarded as a priority issue in the countries of the ESCWA region.

### B. Training and higher education

37. The ability of institutes of technical training and higher education to answer the needs of industry for new materials technologies will be of paramount importance during the next few years. These institutions are therefore urged to cooperate with each other and with concerned national, regional and international organizations in creating, revising and harmonizing modern curricula for training and higher educational institutions. This should be carried out on the basis of the needs of production sectors and should aim at answering specific problems in new materials applications. The ESCWA member countries will therefore need to organize a regional meeting on education in materials science and technology, which should include representation by NGOs and industry as well as regulatory and environmental protection bodies.

### C. Regional and international cooperation

38. Regional and international cooperation will constitute an important source of support for enhancing new materials capabilities in ESCWA member countries. Concerned institutions in ESCWA member countries are therefore urged to investigate all possibilities to enhance such cooperation.

39. Concerned institutions in ESCWA member countries are also urged to make use of the programmes available for cooperation with European and other industrialized countries in R and D and higher education.



### 1. Regional new materials network

40. R and D and higher educational institutions in ESCWA member countries active in new materials technologies have much to learn from one another, and they stand to benefit a great deal as well. Therefore it is strongly suggested that a network of R and D and higher educational institutions be created to specific materials technologies in ESCWA member countries. This network should also involve industrial enterprises, producers' associations, trade federations and professional bodies concerned with materials science, engineering and applications.

41. Institutions participating in this network should be selected so as to contribute to its activities in specific R and D, educational and technology transfer activities. Some of the principal functions of this network would be to coordinate the activities of the member institutions in the following:

- (a) Collecting and disseminating information on selected new materials technologies;
- (b) Organizing exchange programmes for scientists and technologists, as well as trainees, in specific areas of new materials technologies;
- (c) Conducting studies in new materials technology assessment;
- (d) Carrying out feasibility studies aimed at setting up and promoting new materials technology enterprises in ESCWA member countries;
- (e) Conducting economic analyses, market research and social/environmental impact assessments;
- (f) Monitoring the possibilities offered by new institutional mechanisms, such as liaison bodies and business incubators, aimed at the promotion of new materials technologies.

42. The activities of the proposed network should be coordinated by the network's member institutions in cooperation with international and regional institutions such as UNIDO and ESCWA.

43. The network should have as its core institution a regional centre for materials R and D and training, which could ideally be established in an existing small to medium sized institution in one of the ESCWA member countries. The regional centre should have the mandate to carry out R and D and high-level training in selected areas of common interest to the ESCWA member countries.

### D. R and D and industry

44. Strengthening new materials R and D at the firm level will be an important component in any new materials strategy that is to have a continuing impact on industrial and technological development in ESCWA member countries. However, new methodologies will have to be formulated in order to take into account the needs of small and medium enterprises in new materials.

45. Concerned governmental and non-governmental institutions in ESCWA member countries are urged to cooperate with concerned regional and international organizations with a view to elaborating and implementing such methodologies.

46. Enhancing endogenous capabilities in new materials technologies will be greatly assisted by the establishment of national specialized materials technology R and D centres equipped with the necessary pilot plant facilities and computer capabilities or the strengthening of existing centres. The primary objective of such centres will be to provide science and technology services to local firms. Services provided by these centres should include the design of new materials products and processes as well as quality control and assurance procedures in such areas as composites, polymers and their blends, polymer modified concretes and ceramics, recycling and biodegradation. These national material technology R and D centres should be located close to centres of excellence and research groups active in the above-mentioned areas.

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Annex II

## LIST OF PAPERS AND PRESENTATIONS

<u>No.</u>	<u>Title</u>	<u>Author</u>
1.	New Composite Materials Technologies in the ESCWA Region.	Luigi Nicolais University of Naples Naples, Italy
2.	Composite Materials Technologies: A Syrian Case Study	Y. Arslanian Scientific Studies and Research Centre Damascus, Syrian Arab Republic
3.	Promoting the Commercial Application of Composites and Plastic Materials Technologies in GCC countries	M. R. Baban; A. Fayad; and . Abu-Hamda Gulf Organization for Industrial Consulting Doha, Qatar
4.	Polymer Reinforced Composite Materials Manufacturing; Opportunities in the ESCWA Region	W. Grimm Composite Engineering Consultants Vienna, Austria
5.	New Polymeric Materials Technologies	Enrico Albizzati Montell Italy
6.	Developments in Polyolefin Technologies: Prospects for Applications in the ESCWA Region	Halim Hamid King Fahd University of Petroleum and Minerals Dhahran, Saudi Arabia
7.	International Licensing in Polypropylene Technology	Salvatore Ali Technopol Milan, Italy
8.	The Role of Academia in Technology Transfer and Technology Development	I. Kamel, Faculty of Engineering; Abdelrahman Al-Sharhan, Faculty of Science A. Mortagy Faculty of Econ. & Adm. Sciences United Arab Emirates University



<u>No.</u>	<u>Title</u>	<u>Author</u>
9.	Polypropylene Manufacture by the BASF Spheripol Process	G. Hatzmann Badische Anilin und Soda Fabrik (BASF) Leverkusen, Germany
10.	Developments in Polymer Blends and Related Technologies: Prospects for Applications in the ESCWA Region	Olagoke Olabisi King Fahd University for Petroleum and Minerals Dhahran, Saudi Arabia
11.	Agricultural Utilization of Polymers for water Conservation and for Controlling Environmental Pollution of Herbicides	A. Akelah United Arab Emirates University
12.	Polyimides: Practical Applications in the ESCWA Region	M. H. Kailani Royal Scientific Society Amman, Jordan
13.	The Development of New Materials and Specialty Chemicals of Industrial Interest in the State of Kuwait	Jasem Besharah Kuwait Inst. for Scientific Research Kuwait
14.	Plastics Recycling in the ESCWA Region	G. Derwish & B. El-Eswad University of Jordan Amman, Jordan
15.	Degradation of Polymers and Plastics.	Salman R. Salman University of Yarmouk Irbid, Jordan
16.	Production of Membrane Materials for Expanding Applications of Membranes in Water Treatment in the ESCWA Region	M. Sartawi Social Security Corporation Amman, Jordan
17.	Techno-Economic Issues in the Manufacturing of Selected Advanced Ceramics in Egypt.	Nabil Ghoneim National Research Centre Cairo, Egypt
18.	Bioceramics: Industrialization and Commercialization in the ESCWA Region	Wafa Abdel-Fattah National Research Centre Cairo, Egypt

<u>No.</u>	<u>Title</u>	<u>Author</u>
19.	The Glass Industry in Syria and Opportunities for its Development: with Special Reference to Pilot Production of Optical Glass.	Rafie Jabra Higher Inst. for Applied Science and Technology Damascus, Syrian Arab Republic
20.	Upgrading Cement-Based Materials in the ESCWA Region.	A. S. Babaqi Sana'a University Sana'a, Yemen
21.	Utilization of Local New Materials for Glass and Ceramics Production in Saudi Arabia	M. A. Amjad King Abdulaziz City for Science and Technology
22.	Polymer Modified Cement Materials in the ESCWA Region	M. Sartawi Social Security Corporation Amman, Jordan
23.	New Materials Technologies: A Regional Perspective Dimension.	Omar Bizri ESCWA Amman, Jordan
24.	New Materials Technologies: A UNIDO Perspective.	Vladimir Kojarnovitch UNIDO Vienna, Austria

Annex III

ORGANIZATION OF WORK

Sunday, 1 October 1995

09:00 - 10:30

Opening Session

Opening Addresses by:

His Highness Sheikh Nahyan bin Mubarak Al-Nahyan, Minister of Higher Education and Chancellor of the United Arab Emirates University.

The United Nations Industrial Development Organization (UNIDO).

The United Nations Economic and Social Commission for Western Asia (ESCWA).

11:00 - 13:30

First Session

"Composite Materials Technologies"

New Composite Materials Technologies in the ESCWA Region.  
Professor L. Nicolais, University of Naples, Naples, Italy.

Composite Materials Technologies: A Syrian Case Study  
Mr. Y. Arslanian, Scientific Studies and Research Centre, Damascus, Syrian Arab Republic.

16:30 - 18:00

Second Session

Forum I: Promoting the Commercial Application of Composites and Plastic Materials Technologies in the ESCWA Region.

Principal Speaker: Mr. Abu Hamda, Gulf Organization for Industrial Consulting, Doha, Qatar.

Other Speakers: Mr. W. Grimm, Composite Engineering Consultant.

Monday, 2 October 1995

08:00 - 09:30

Third Session (I)

"Polyolefins and Polyolefin Technologies"

New Polymeric Materials Technologies  
Mr. E. Albizzati, Montell, Italy

Monday, 2 October 1995 (continued)

Developments in Polyolefin Technologies: Prospects for Applications in the ESCWA Region  
Mr. H. Hamid, King Fahd University for Petroleum and Minerals.

International Licensing in Polypropylene Technology  
Mr. S. Ali, Technopol, Italy

09:30 - 10:30

Third Session (II)

The Role of Academia in Technology Transfer and Technology Development.  
Mr. I. Kamel, Dean, Faculty of Engineering, United Arab Emirates University, Al-Ain.  
Mr. Abdelrahman Al-Sharhan, Faculty of Science, United Arab Emirates University, Al-Ain.  
Mr. A. Mortagy, Dean, Faculty of Economics and Administrative Sciences.

11:00 - 13:30

Third Session (IV)

"Polyolefin Blends and Other New Polymer Technologies"

Developments in Polymer Blends and related technologies: Prospects for Applications in the ESCWA Region.  
Mr. O. Olabisi, Research Institute, King Fahd University for Petroleum and Minerals, Dhahran, Saudi Arabia.

Agricultural Utilization of Polymers for Water Conservation and for Controlling Environmental Pollution of Herbicides.  
Mr. A. Akelah, United Arab Emirates University, Al-Ain, United Arab Emirates.

Polyimides: Practical Applications in the ESCWA Region.  
Mr. M. H. Kailani, Royal Scientific Society, Jubaiha, Jordan.

The Development of New Materials and Specialty Chemicals of Industrial Applications in the State of Kuwait.  
Mr. J. Besharah, Kuwait Institute for Scientific Research (KISR), Kuwait.

Plastics Recycling in the ESCWA Region.  
Professor G. Derwish, University of Jordan, Amman, Jordan.

Degradation of Polymers and Plastics.  
Professor S. R. Salman, University of Yarmouk, Irbid, Jordan.

16:30 - 18:00

Fourth Session

Forum II: Building Capabilities in the Commercial Application of New Polymeric Materials Technologies in the ESCWA Region.

Monday, 2 October 1995 (continued)

Principal Speaker: Professor L. Nicolais, University of Naples, Naples, Italy.  
Other Speakers: Mr. M. Sartawi, Social Security Corporation, Amman, Jordan.  
Representative of the Saudi Basic Industries, Riyadh, Saudi Arabia.  
Mr. J. Besharah, Kuwait Institute for Scientific Research, Kuwait.

Tuesday, 3 October 1995

08:30 - 10:30

Fifth Session (I)

"Ceramics, Cement-based Composites and Glass Technologies"

Techno-economic Issues in the Manufacturing of Selected Advanced Ceramics in Egypt.

Professor N. Ghoneim, Department of Ceramics, National Research Centre, Cairo, Egypt.

Bio-ceramics: Industrialization and Commercialization in the ESCWA Region.

Professor W. Abdel-Fattah, Ceramics Department, National Research Centre, Cairo, Egypt.

The Glass Industry in Syria and Opportunities for its Development: with Special Reference to Pilot Production of Optical Glass.

Mr. R. Jabra, Head, Materials Laboratories, Higher Institute for Applied Science and Technology, Damascus, Syrian Arab Republic.

11:00 - 12:00

Fifth Session (II)

Upgrading Cement-based Materials in the ESCWA Region; with Special Reference to the Case of Yemen.

Professor A. S. Babaqi, Centre of Science and Technology, Sana'a, Yemen.

Utilization of Local New Materials for Glass and Ceramics Production in Saudi Arabia.

Mr. M. A. Amjad, King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia.

Polymer Modified Cement Materials in the ESCWA Region.

Mr. M. Sartawi, Social Security Corporation, Amman, Jordan.

12:00 - 13:00

Fifth Session (III)

"Networking and Institutional Arrangements for the Promotion of Materials Technologies in the Region"

New Materials Technologies: The Regional Dimension.

Mr. O. Bizri, Technology Section, UN-ESCWA, Amman, Jordan.

Tuesday, 3 October 1995 (continued)

New Materials Technologies: A UNIDO Perspective.  
Mr. V. Kojarnovitch, Investment Promotion and Technology, UNIDO, Vienna,  
Austria.

16:30 - 17:30

Sixth Session

Concluding Session

Recommendations of the Expert Group Meeting

Concluding Address

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