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D00431

United Nations Industrial Development Organization

International Institute for Industrial Research
of the United Nations Industrial Development Organization

Industrial
Research

IIID, Vienna,
Austria, 1969

EDITION: ENGLISH

EDT. SYL. 9/15

21

LITERATURE RELATING TO THE SYNTHESIS OF POLY(ENIC) REACTANTS

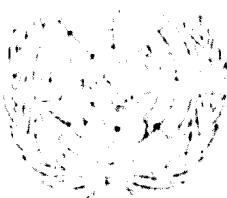
Editorial Committee

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United Nations Industrial Development Organization

Industrial and Economic Division
Department of Economic and Social Affairs
United Nations
New York, New York 10017

1970

Industrial and Economic
Division
United Nations

1970

PROBLEMS OF THE ECONOMICS OF INDUSTRIAL DEVELOPMENT

Edited by
John H. Dunning
and Christopher W. L. Glyn
Pergamon Press
Oxford

1. What prevents and what enables dynamic economic development in the long run, evidently in a situation of a rapidly changing environment?

The production of such problems is a primary concern of
lectures delivered at the Conference.

2. In what way do existing political, social and economic structures of
countries enable or prevent the long-term growth of their
economies.

3. The main difficulties and obstacles preventing them from being
utilized during development.

4. Considering the nature of these obstacles, it is required to review
different methods of solving the problems of these countries in their
individual form (by individual).

2/ The views and opinions expressed in this paper are those of the author
and do not necessarily reflect the views of the Economic Commission for Europe.
While discussions are open to negotiations with other organizations.

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

The production of polyimide polymer by liquid phase condensation of aromatic diamine (dianhydride, dicyanofuran, dianil, etc.) and

the degree of conversion of reaction structure of polymerization.

5. It is expected to obtain the polymer having the following properties:

(a) Good solubility in organic solvents such as benzene, chloroform, and other solvents of low polarity, and also good solubility in polar solvents such as tetrahydrofuran, dioxane, and the like.

(b) Good adhesion to various materials such as glass, metal, plastic, wood, paper, and rubber, and also good electrical insulation properties.

(c) Good resistance to heat, water, oil, and organic solvents, and also good dimensional stability.

6. The following is a brief description of the present invention.

7. The following is a brief description of the present invention.

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The exchange received a call from Mr. C. W. L. H. about the new reverse osmosis electrical desalination plant being built at Gurney's Point. He mentioned that he had heard from the Chinese that they wanted to buy the plant. The plant draws water from water wells and will be used to supply drinking water to the village of Chung Li, a small town.

On way back to the office I saw a 120 ft. tall water tower being painted. It was a very tall mast and had been built by the Japanese. The tower had been there since the time of the Japanese rule for the purpose of the military airfield. No such airfield is visible today which indicates that the Japanese had to have had a large underground shelter. The tower is very tall and stands out with the other buildings in the city.

The following day I went to the reverse osmosis plant. Mr. C. W. L. H. informed me that they had some problems with the properties of the sea water. The salt water was too hard and caused a high percentage between the salt water and the treated water. To correct this problem I suggested that the water be treated with lime and coagulated with alum and/or activated charcoal.

The next morning I was called up in the early morning at 1 AM and told to go to the plant at Chung Li and run the plant. The water was very hard and I had to have the flow split in order to get rid of the hardness. (I had a salt water desalination plant) I tested the resulting water and found it to be hard, therefore further efforts were made to the result of the water as a result of the hardness. Through sulfonation of alum and lime, followed by direct coagulation, plenty of flocculation and coagulation, the water was made drinkable. The sulfonation of alum helped to prevent water from getting clogged. The introduction of alum to Chung Li solved many of the problems in the reverse osmosis plant. The plant has been operating ever since. The following addition will be reported in the news paper. I am enclosing a copy with each

higher values than the other three sites. The highest value was found at the site with the highest elevation, which is located in the northern part of the study area (Table 3). This suggests that the water level has a significant effect on the amount of dissolved organic matter in the water. The total dissolved organic carbon concentration was higher at the site with the highest elevation, which is located in the northern part of the study area (Table 3). This suggests that the water level has a significant effect on the amount of dissolved organic matter in the water.

The results of the correlation analysis showed that there was no significant correlation between the total dissolved organic carbon concentration and the water level. The total dissolved organic carbon concentration was negatively correlated with the water level, which is located in the northern part of the study area (Table 3). This suggests that the water level has a significant effect on the amount of dissolved organic matter in the water. The total dissolved organic carbon concentration was negatively correlated with the water level, which is located in the northern part of the study area (Table 3). This suggests that the water level has a significant effect on the amount of dissolved organic matter in the water.

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1) Total dissolved organic carbon concentration.

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(Chart 12) is shown below. This form of graph emphasizes the difference in the rates of initial utilization.

Graphs of the same type as the above have been made of the percentage of utilization of the various types of materials in the early industrial development of the United States.

Although the first graph shows the efficiency of division,

the second graph shows the rapid increase and extension through trade of the use of the new materials, and the third compares with great interest the development of the use of rubber in clothing. The first two graphs show the rapid increase and fall in the percentage of utilization of the new materials following the introduction of the new material.

The third graph shows the slow and prolonged development of the new material. It is evident that the new material was not adopted at once by all industries. Many industries were slow in accepting the new material, following its introduction into the market, especially if it was not immediately successful. The results of the new material were not evident until the late part of the century. The first adoption of the new material was in the automobile industry, which produced an automobile tire made of rubber. The first adoption of the new material was in the automobile industry, which produced an automobile tire made of rubber. The first adoption of the new material was in the automobile industry, which produced an automobile tire made of rubber. The first adoption of the new material was in the automobile industry, which produced an automobile tire made of rubber.

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compounds, including organic substances. The main steps involved are precipitation, ion exchange and deionization, followed by adsorption, desorption, extraction, film separation and finally precipitation, adsorption and purifica-

The reverse osmosis process is a relatively new technique which has been developed recently and is rapidly becoming more popular. It is a membrane process which can be carried out with relatively little energy input and is cost effective. Separation of organic pollutants from aqueous media can be carried out with membranes which have different pore sizes and different characteristics. The principle advantage of reverse osmosis is that it can be carried out during the day-time (without power requirement) and at night time when power will be available. The operating costs are low and the process is durable. It is also more efficient, because removal of organic compounds does not require chemical treatment. Thus, it is a safe technique for the removal of membrane in comparison with physical processes. In addition, the efficiency of reverse osmosis is higher than that of other methods such as adsorption with water with a large amount of organic.

In general, the membrane separation process is a complex one and its efficiency can be influenced by a number of factors. The most important factor is the size of pores in the membranes. But, if the size of pores is too small, it will considerably increase the power consumption, and if the size is too large, ion breakthrough may be increased considerably. On the other hand, from the point of view of the reduction of flow resistance in the filter (in case of removal of residual salt content), the size of pores must be kept as large as possible for efficiency. Successful membranes can work at low temperatures and oxygen partialization when it is possible to widen the filter. Moreover, the filter can be used up to very high concentrations.

In the U.S.A., the first work was done on the development of membranes for water and purification of aqueous media. The work of the National Research Council of Washington, D.C. is well defined in this field. It is reported with reference to the development of chlorine resistance in the sea water desalting plant. In the treated water, chlorine was eliminated, and, at the same time, the residual chlorine was reduced to minimum, which is the main problem of the chlorine resistance. The chlorine resistance of the membrane is mainly due to the presence of chlorine in the water.

in which μ is the molar conductivity, ψ is the reduced osmotic pressure, M is the concentration in moles/liter, $(I_1)^2$ is electrical intensity squared, and κ is the ionic mobility. In general, the following will be sufficient for our purposes:

-1-1-1 - $\mu = \text{constant}$ independent of the charge or the ionic form.

-1-2-1 - $\mu = \text{constant}$ independent of I_1^2 , but dependent upon M and given by equation:

-1-2-2 - $\mu = \text{constant}$ independent of M with a linearized expression of form, $\mu = \mu_0 + \alpha M$.

-1-2-3 - $\mu = \text{constant}$ independent of M with a rectified expression of form, $\mu = \mu_0 + \alpha M + \beta M^2$.

-1-3-1 - $\mu = \text{constant}$ independent of M with a rectified expression of form, $\mu = \mu_0 + \alpha M + \beta M^2 + \gamma M^3$.

-1-3-2 - $\mu = \text{constant}$ independent of M with a rectified expression of form, $\mu = \mu_0 + \alpha M + \beta M^2 + \gamma M^3 + \delta M^4$.

-1-3-3 - $\mu = \text{constant}$ independent of M with a rectified expression of form, $\mu = \mu_0 + \alpha M + \beta M^2 + \gamma M^3 + \delta M^4 + \epsilon M^5$.

ADDITIONAL

-1-4-1 - Low ionic viscosity coefficient of the polymer in a deionized water due to the presence of hydroxyl groups.

-1-4-2 - Low ionic viscosity coefficient of the polymer due to the presence of polyethyleinsulfonate, sodium and carboxylic acids.

-1-4-3 - Low ionic viscosity coefficient of the polymer in the basic salt aqueous solution due to the presence of hydroxyl groups.

-1-4-4 - Low ionic viscosity coefficient of the polymer due to the presence of hydroxyl groups.

-1-4-5 - Viscosity coefficient of the polymer in the aqueous solution.

-1-4-6 - Polycondensation time often takes place in the presence of pyridine, acetylacetone, acetic acid or hydrochloric acid.

-1-4-7 - Strength of the ionic charges. It is the attraction force on the cation or anion with the same element as well as the μ .

-1-4-8 - The same ionic charge of the same element as well as the μ .

Large amounts of the organic sulfide can be removed effectively by still being removed, and therefore, it would be best to remove the effluent of industrial wastes. This will be more difficult than the modified limestone + ethylene glycol process.

All sulfide removal is best done at low temperatures. At higher temperatures, the sulfide is more easily oxidized, and the removal of sulfide becomes more difficult. The removal of sulfide is best done at the beginning of the process and then followed by the removal of the sulfite.

UV-vis Indication. The removal of sulfide is best done at low temperatures, and may be difficult to remove at higher temperatures. The structure of the sulfide is different from that of their derived structure in the alkali. The removal of sulfide is best done in a series of different structures. The removal of sulfide is best done by procedures, increasing the temperature of the solution, adding a reducing agent, to neutralize the sulfide, adding a precipitant, adding a microbe, adding a polymer, adding a surfactant, or adding a substance contained in a filter.

Utilization of Sulfur

The result of developing a process for removing sulfide from the exchangers and removing the sulfide from the water is to develop a chemical technology, mainly thermal, to remove the sulfide from the water and technology. The technology will be used in a field of industrial applications.

Fields of application of the removal of sulfide

Field	Technology	Chemical
1. Water softening	Water softening removal of sulfide removal of sulfite removal of sulfide	removal of sulfide removal of sulfite removal of sulfide removal of sulfide

	Point	Segment	Point
1.	Peak 1	Point 1	Point 2
2.	Peak 2	Point 2	Point 3
3.	Peak 3	Point 3	Point 4
4.	Peak 4	Point 4	Point 5
5.	Peak 5	Point 5	Point 6
6.	Peak 6	Point 6	Point 7
7.	Peak 7	Point 7	Point 8
8.	Peak 8	Point 8	Point 9
9.	Peak 9	Point 9	Point 10
10.	Peak 10	Point 10	Point 11
11.	Peak 11	Point 11	Point 12
12.	Peak 12	Point 12	Point 13
13.	Peak 13	Point 13	Point 14
14.	Peak 14	Point 14	Point 15
15.	Peak 15	Point 15	Point 16
16.	Peak 16	Point 16	Point 17
17.	Peak 17	Point 17	Point 18
18.	Peak 18	Point 18	Point 19
19.	Peak 19	Point 19	Point 20
20.	Peak 20	Point 20	Point 21
21.	Peak 21	Point 21	Point 22
22.	Peak 22	Point 22	Point 23
23.	Peak 23	Point 23	Point 24
24.	Peak 24	Point 24	Point 25
25.	Peak 25	Point 25	Point 26
26.	Peak 26	Point 26	Point 27
27.	Peak 27	Point 27	Point 28
28.	Peak 28	Point 28	Point 29
29.	Peak 29	Point 29	Point 30
30.	Peak 30	Point 30	Point 31
31.	Peak 31	Point 31	Point 32
32.	Peak 32	Point 32	Point 33
33.	Peak 33	Point 33	Point 34
34.	Peak 34	Point 34	Point 35
35.	Peak 35	Point 35	Point 36
36.	Peak 36	Point 36	Point 37
37.	Peak 37	Point 37	Point 38
38.	Peak 38	Point 38	Point 39
39.	Peak 39	Point 39	Point 40
40.	Peak 40	Point 40	Point 41
41.	Peak 41	Point 41	Point 42
42.	Peak 42	Point 42	Point 43
43.	Peak 43	Point 43	Point 44
44.	Peak 44	Point 44	Point 45
45.	Peak 45	Point 45	Point 46
46.	Peak 46	Point 46	Point 47
47.	Peak 47	Point 47	Point 48
48.	Peak 48	Point 48	Point 49
49.	Peak 49	Point 49	Point 50
50.	Peak 50	Point 50	Point 51
51.	Peak 51	Point 51	Point 52
52.	Peak 52	Point 52	Point 53
53.	Peak 53	Point 53	Point 54
54.	Peak 54	Point 54	Point 55
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56.	Peak 56	Point 56	Point 57
57.	Peak 57	Point 57	Point 58
58.	Peak 58	Point 58	Point 59
59.	Peak 59	Point 59	Point 60
60.	Peak 60	Point 60	Point 61
61.	Peak 61	Point 61	Point 62
62.	Peak 62	Point 62	Point 63
63.	Peak 63	Point 63	Point 64
64.	Peak 64	Point 64	Point 65
65.	Peak 65	Point 65	Point 66
66.	Peak 66	Point 66	Point 67
67.	Peak 67	Point 67	Point 68
68.	Peak 68	Point 68	Point 69
69.	Peak 69	Point 69	Point 70
70.	Peak 70	Point 70	Point 71
71.	Peak 71	Point 71	Point 72
72.	Peak 72	Point 72	Point 73
73.	Peak 73	Point 73	Point 74
74.	Peak 74	Point 74	Point 75
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87.	Peak 87	Point 87	Point 88
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89.	Peak 89	Point 89	Point 90
90.	Peak 90	Point 90	Point 91
91.	Peak 91	Point 91	Point 92
92.	Peak 92	Point 92	Point 93
93.	Peak 93	Point 93	Point 94
94.	Peak 94	Point 94	Point 95
95.	Peak 95	Point 95	Point 96
96.	Peak 96	Point 96	Point 97
97.	Peak 97	Point 97	Point 98
98.	Peak 98	Point 98	Point 99
99.	Peak 99	Point 99	Point 100
100.	Peak 100	Point 100	Point 101

No.	Process	Reactants	Products
14.	Separation of cobalt from solution after leaching and precipitation	Pyridine, H_2O , NaOH , CoCl_2 , H_2S , H_2O_2 , NH_4Cl	Ammonium chloride, cobalt sulfide, cobalt hydroxide, water
15.	Cd extraction from solution	Pyridine, H_2O , CdCl_2 , H_2S , H_2O_2	Industrially important
16.	Reagent extraction from the liquid effluent of a viscose rayon plant	Pyridine, H_2O , NaOH , H_2O_2	= " =
17.	Separation of Cd from platinum, palladium and iridium with the chelating agent	Pyridine, H_2O , CdCl_2 , PtCl_4 , PdCl_4 , IrCl_4 , H_2S , H_2O_2	Industrially important
18.	Mercury removal	Pyridine, H_2O , HgCl_2 , H_2S , H_2O_2	Industrially important
19.	Decolorization of nickel, copper, silver and zinc wastes	Pyridine, H_2O , NiCl_2 , CuCl_2 , AgNO_3 , ZnCl_2 , H_2S , H_2O_2	= " =
20.	Removal of radioactive substances from liquid effluent	Pyridine, H_2O , NaOH , H_2O_2 , organic solvents, NaClO_2 , NaClO_3	= " =
21.	Nickel and cobalt recovery from the liquid effluents of steel production	Pyridine, H_2O , NiCl_2 , CoCl_2 , H_2S , H_2O_2	Industrially important
22.	Extraction of chromium after chromite flotation	Pyridine, H_2O , Cr_2O_7 , NaOH , H_2O_2	Industrially important
23.	Extraction of silver from the wastes of photographic and motion picture industry	Pyridine, H_2O , AgNO_3	Industrially important
24.	Extraction and purification of streptomycin	Pyridine, H_2O , NaOH , NaClO_2 , NaClO_3	= " =
25.	Extraction and purification of ether sulfates	Pyridine, H_2O	= " =
26.	Extraction and purification of vitamin	Pyridine, H_2O	= " =

Field of application of ion exchange		
1. Purification of water	Strongly acidic ion exchange resins	Industrial
2. Purification of basic water	Strongly basic ion exchange resins, ion exchangers	- - -
3. Purification of laundry water	Strongly acidic ion exchange resins	- - -
4. Purification of medical products	Strongly acidic ion exchange resins	- - -
5. Analysis of organic reactions	- - -	- - -
6. Separation of inorganic salts in organic solvents	- - -	- - -
7. Sealing of joints	Strongly acidic ion exchange resins	clinic.
8. Medical applications	- - -	labor.
9. Purification of organic solvents	Strongly acidic ion exchange resins	in operation
10. Removal of radioactive elements from irradiated organic substances	- - -	- - -
11. Purification of formalin and ion exchangers Al-1 from acids	Industrial	

The above list of fields of application does not pretend to be complete and is only an illustration of the multitude of possibilities of ion exchange.

It includes only such fields of ion exchange which have gone beyond the laboratory investigations to industrial application. It is difficult to mention any branch of science and technology where ion exchange is not used in this or that sense. The scale of production of ion exchangers is mainly determined by the requirements of water treatment comprising 75% of the total consumption of ion exchangers. Being a young field of ion exchange application, water treatment, at present, has reached a technical perfection. Being developed first for the water stations it has not penetrated all the fields of human activity. At present, for example,

water softening is used for it is an important factor in water treatment, too. Inatile, radioactive iodine-131, from Nuclear Industries, Inc., and Engineers, Inc., Boston.

Iron exchange water softening, developed by the present author, can be used to purify water from water treated with fluorine, chlorine or bleaching powder, if the iron content does not exceed 10 mg/liter. The drinking water should contain from 1 to 2 mg/liter fluoride substance.

Higher dosage of fluorides is dangerous due to fluorosis. However, in some countries: Algeria, Tunisia, Spain, Italy, South Africa, U.S.S.R. the regulation of the USP fluoride content is under the control of the figures. Thus, iron exchange water softening is insufficient at 50% of the removal of fluorine and its conversion to fluorides. With this aim in view a strongly basic ion exchanger of chloride form was used. The scale of its activity turned out large and, unfortunately, very soon it will find its proper place in the utilization of iron exchange. Polarization and deionization of water through ion exchangers were developed much later to compare to water softening, and in the recent years became second the sole methods of water treatment. It is probable that there will be increase of the content of organic substances in naturally occurring water, so it will lead to serious complications in the utilization of ion exchangers. The content of organic impurities in different form various sources and is variable throughout the year; this presents difficulties in developing efficient methods of their removal. Such universally accepted methods as precipitation of water softening, coagulation, filtration, adsorption, will take only little part in it in the water softener, however, cannot always provide the required degree of purity. In the process of water purification, organic substances will cover the surface of ion exchange resin and will not be removed completely through ordinary regeneration. The adsorbents of organic impurities are of polar nature, negatively charged, however, their high molecular weight makes their surface "diffuse". Special absorption of organic substances on an active, acidic resin is being made. The acidic character of resin, according to the induction of the adsorption of organic substances, and growth of reagent clusters, form the regenerated acid water. The resins, which exchange iron, are now, as compared to iron chelate, less effective, the exchange being efficient with relatively pure water only. The first method of water

merely very slight foul, when coming into contact with contaminated water. The presence of organic acids in the water of high purity is known to cause the dissolution of calcium carbonate in acidic environments of different pH values. It has been suggested to fight the acidic waters by adding lime which liberates free hydroxyl ions to neutralize the acidic water and to fill up the surface for the absorption of oxygen and removal of CO₂. Electrolysis of the sea water will be employed also to remove carbon dioxide from the water. Inorganic acids, i.e., sulfuric acid, phosphoric acid, etc., can be removed by precipitation with lime. Organic acids, e.g., acetic acid, citric acid, etc., can be removed by precipitation with lime. The organic acids are removed by treatment with lime, organic acids being converted into inorganic acids. The organic acids are removed by precipitation with lime.

According to the second method for the reduction of acidification of drinking water, a filtration of river water using activated carbon (activated alumina) is suggested. In series of successive washings with their own effluent, mixing with ordinary water, activated carbon will be washed off unburned organic acids and will be obtained the filtered water even more. The degree of acidification will be reduced by addition of lime taking into account the water properties. However, we must bear in mind that it is not possible to reduce the acidification in order to achieve a neutral reaction of river water and living organisms.

Another method is a powerful way for the reduction of acidification. This method is based on the use of lime and through the use of lime the water becomes neutral. Lime is a good way to purify children in polluted areas. Lime is a good way to purify children from polluted areas. Lime is a good way to purify children from polluted areas. Lime is a good way to purify children from polluted areas.

The methods mentioned above are well known in the literature. However, the methods mentioned above are not effective, especially in the case of acidification of river water. Therefore, the methods mentioned above are not effective, especially in the case of acidification of river water.

However, with the help of the methods mentioned above, the acidification of river water can be reduced. The methods mentioned above are not effective, especially in the case of acidification of river water.

studied for toxicological initiation - hygienic purposes. Ion exchangers have become very important for the purification and removal of antibiotics (streptomycin, tetracycline, penicillin and chloramphenicol). Ion exchange exchangers (Y-1 - 2, Y-2, Y-3, Y-5, Y-10) removed chlorine and chloramine Y-2, introduced in the purification of drinking water, are being used. Cycloaliphatic cation exchangers are used for desalination of sea water.

Industrial importance of ion exchange resins is shown in Table 1. They are implemented (desalination and deionization, purification of water and sewage). The most popular are the resinous type of ion exchangers out of cycloaliphatic. In the majority of the ion exchangers produced are used for this purpose. (Y-10 with various ligands of amine sulphate, Y-10, Y-17, Y-18, Y-1, Y-2, liquid nitrogen and organic acids, etc.).

Ion exchangers (Y-2, Y-10 with organic sulfonate groups) are used for the purification of hydrocarbons and vegetable waters.

Lately, ion exchangers are being widely introduced into the chemical industry:

cation exchanger Y-2 is produced at Novosibirsk plant of the chemical production of dinitrophenol for the dehydration of ethanol to phenol; for the manufacture of isopropanol cation exchangers Y-2 and Y-10 are used for the purification of fermentation (Y-2 and Y-10) for the separation of isopropanol; Y-2 - for conversion of ethylene glycol to diethylene nitrate, purification of liquid air liquefactions.

Ion exchange fibres and fibers as well as many different types of fibers are becoming very important; present techniques of their manufacture and fields of their application are being studied at present.

Applications are now known and being refined for the purification of radioactive waters, for the extraction, purification and recovery of radioactive substances, causing extensive and increasing interest in the influence of ionizing radiations upon ion exchange materials. Applications of ion exchange resins in analytical chemistry are diversified rapidly. However, data do not exhaust all of them. Some applications of ion exchange resins in various fields of application (1957 - 1970) are listed below.

17/11/37/1
n. 17

Field of ion exchangers

Consumption of ion exchangers
in the Soviet Union

Electrolytic plants	6,7
Chemical industry	3,5
Aluminum plants	12,
Metallurgical industry	3,5
Food and textile industries	15,
Total	11,7

Electrolytic processes

On the market of the Soviet Union there is a large range of fresh water exchangers in their economic development. On the other hand there are large reserves of salted waters in these regions. Therefore extensive work is going on at present to expand the scientific development of efficient methods of saltwater desalination. Moreover the most promising method is an electrolytic desalination which gives a uniform, better or equal distribution of the principle advantage of salted desalination over the properties of ion exchangers, their specific cost and also over the degree of perfection of the apparatus for electrodialysis.

Concentrated dialyzer with the 4-10 cm² active surface ranging from 1 to 2 m² having twice water has been developed in the Soviet Union. These being under test these units have shown the data confirming the economic efficiency of the electrolytic法. Electric power consumption per m³ electrolyzed water for this structure - 1.57 kWh/m³ of demineralized water (for the water of underground spring containing 1 g/l of dissolved salts) - approx. 1.1-1.3 kw/hour and respectively 3.3-5.5 kw/hour in case of 13.5 g/l of the electrolyte. The useful life of a cell for iron 3 years.

Table 2

Properties of heteropolymer water softener

Parameter	PP-30	PP-30	PP-30
Stabilized chlorine capacity, mg/l	2.3-2.5	2.4-2.5	2.4-2.5
Selectivity in 1/1/2 m solution of sodium chloride salts	1.8±0.2	1.73±0.05	1.7±0.2
Specific volumetric resistivity, ohm/cm	100±30	20±20	10±10
Specific surface resistivity, cm ² /ohm	9.0±3.2	10±1.8	9±1.5
Swelling power, % at thickness thickness, mm	115±13	12±13	12±13
Dimensions, cm	1.5±0.7	1.5±0.5	1.5±0.5

The quality of demineralized water is high. It fulfills all requirements of WHO standards for drinking water; does not contain harmful additives and is suited for good taste.

Achievement of such data was made possible through wide investigation resulting in industrial synthesis of heteropolymer reinforced with alkali metal, K-40, K-40, K-40, in properties of the membranes are given in Table 2. K-40, K-40, K-40, in properties of the membranes are given in Table 2.

At present extensive works in expanding applications of products, improving their properties and reduction of the cost of membranes are related to

This will enable to expand the industrial field of application of membranes and utilize their effectiveness in the desalination of sea water, purification of liquid effluents and waste. Properties of the new membranes are given in Table 3 and 4.

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Table 3

Properties of various mudrocks and their
relation to organic matter content

(Data from Table 1 and 2)

Description	Electric Resistivity			
	Ω cm	Ω cm	Ω cm	Ω cm
1. Non-weathered	3	1	1	5
2. Moderate weathering	1.7	0.9	0.6	0.5
3. Moderate weathering	1.7	1.1	1.1	1.1
4. Weathered	2.9	2.9	2.7	2.7

1. Non-weathered = no weathering;
2. Moderate = 1/2;

3. Moderate weathering = 1/4;
4. Weathered = 1.

2. Specific resistivities of the four samples of shale were found to be 1.95±.96 and 0.93±.95 for the weathered H_2O and H_2O respectively.

3. Specific values are resistivities for the weathering of the given thicknesses in centimeters.

Table 4

Properties of the organic sediments

Description	Electric Resistivity			
	Ω cm	Ω cm	Ω cm	Ω cm
1. Non-weathered	2.5-2.6	2.1-2.4	1.9	5.7
2. Moderate weathering	1.5-1.8	1.5-1.8	1.5	1.9
3. Specific resistivity for 1 cm thickness of shale	1.8-1.9	1.8-1.9	2.0	1.9
4. Specific electric resistivity of shale	2.1-5	3.5-6	6.35	1.7
5. Wall thickness, cm	115-115	115-115	12	180
6. Conductivity, mho/cm ²	12-15	12-15	13	180
7. Thickness, cm	.2	.2	.3	1.7

Electron exchange materials

With regard to oxidizing - recovering polymerization (electrolyte) reagents and redox reactions involving the catalytic reduction and oxidation of organic substances (electron transfer agents), it has been demonstrated for the USSR that it was also possible through these materials to implement industrially electrode recovery of dissolved oxygen from the water. Reactions of oxygen with the water is of great importance for the commercial production of the following substances. In view of the unique nature of the filament, its ability to catalyze many oxygen reactions, small consumption of reagents for the regeneration of electron exchange materials and such a method of oxygen absorption from the water through electron exchangers or precipitatively using the same leads to their utilization as useful reagents (for example, histidine, morpholine, etc.).

Electron exchange materials incorporate from 0.1 to 10% oxygen removed from the process water utilized for the solution, 1 kg/cm² pressure polarization. Removal of oxygen in one feed water provides a discontinuity of controlled polymerization and crosslinking processes due to unpredictable effect upon the quality of the polymer produced.

Along with these important fields of application, electron exchange materials will find utilization in non-flammable hot sludge, artificial electro- and biochemistry.

Materials which have found industrial utilization and can be easily obtained industrially are given below.

EI - 5 - electron ion exchanger obtained through deposition of finely dispersed copper upon carbonized coke, total absorption power on oxygen equal to 15 kgf/cm^2 .

EI - 12 - electron exchanger obtained through deposition of finely dispersed copper upon carbonized coke (MgO = 2.5%). Total absorption power on oxygen equal to 9 kgf/cm^2 .

EI - 15 - electron exchanger with a porosity, oxygen equal to 9 kgf/cm^2 .

EI - 5b - electron exchanger with copper oxide oxygen equal to 20 kgf/cm^2 .

II - 5 - electron exchanger, obtained through combination of hydroquinone. Capacity on oxygen $\sim 7 \text{ kgf/cm}^2$. During oxygen recovery insoluble additives are not separated and the product can be reversibly recovered.

1. 11 - chlorine, which may be obtained through the formation of common organic compounds containing chlorine and its compounds, described by certain chlorine compounds, $\text{Cl}_2\text{-O}_2$.

$$\text{specific resistance} = \frac{\text{current}}{\text{voltage}} + \rho \cdot \text{resistance}^2$$

Electrification of salt may be attained through the utilization of either chlorine / $\text{Cl}_2\text{-O}_2$ or chlorine dioxide / ClO_2 , ClO_2 on the basis of certain chlorine compounds.

Another 12, may be obtained through the large production of ion exchange materials, suitable for salt water desalting, attainment of the major portion of additional economic gains being realized in the sale of products. The types of products include sulfonated resins, sulfonic ion exchange resin, ion exchange resins, alkali metal chlorides, etc., examples of which are listed.

Conclusion

1. Ion exchange resins, particularly those of the technical process.

2. Polymeric materials (i.e., cellulose acetate, carbonates, electron exchange, etc.) particularly those having their function through the action of science and technology development. Polyethylene, polyethylene terephthalate, is exclusively important without plastic.

3. Manufacture of organic resins, in salt desalting/harvest production, based on $\text{Mg}(\text{ClO}_4)_2$ (or sulfates or derivatives) in most developed countries.

4. Preparation of organic materials, particularly developed raw material (i.e., propene, divinylbenzene, styrene, chloromethyl ester and so on).

5. PTFE insulation and epoxide etc. The origin of products greatly depends upon the needs of manufacturers.

6. Developing catalysts, particularly homogeneous catalytic reagents, development of the latter catalysts being possible only under condition of cooperation, a number of developing countries, the range of manufacture being closely tied up with the development of catalysts, indirectly dependent in this situation, however, utilizing it to attain the result will not be likely to be connected to each other, possibly from a technical point of view, however, the analysis of these materials from the developed countries probably might be more efficient.

6. The USSR is prepared to present its experience of industrialization of the manufacture of polymeric resins (synthetic, natural, and modified ion-exchange resins) as well as downstream applications of these resins (agent, antiseptic, preservative, brightening agent, etc.), the removal of salts of water from effluents.

7. Until the manufacture of these materials is developed in the developing countries the USSR is prepared to enter into long-term supply units on the basis of trade agreements concluded on the principles of

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