Fourth International Conference on Inorganic Membranes

July 14-18, 1996
Gatlinburg, Tennessee USA

Preliminary Program and Registration Form

Conference Chairman: D.E. Fain
Conference Co-Chairmen: Y.H. Ma
M.A. Anderson

BOOK OF ABSTRACTS

Fourth International Conference on Inorganic Membranes
July 14 - 18, 1996
Gatlinburg, Tennessee, USA

Potential Place of Inorganic Membranes in Bio- and Space Technologies

Yelshin Alexander, Polotsk State University, Blokhin St.,29, BY-211440 Novopolotsk, Belarus. Tel.+375-2144-56340, Fax +375-2144-54263

The growth of attention to the space industrialization is not in the last turn explained by the increasing opportunities of production of new materials, new technologies realization, solution of energy problems, moon resources utilization. It should be noticed that space industrialization allows to reduce anthropology pressure onto the Earth environment. It becomes evident that in the nearest future nature preservation measures on the Earth will be more expensive than transfer of some kinds of industrial technology into space.

Therefore in the general models of space industrialization it would be quite timely to single out and analyse some particular problems regarding the possibilities of using separate groups of processes and their accomodation to the new operating conditions as involving many people in space industrialization will demand fundumentally new approaches to the integrated closed life support system and to organization of industrial production.

Membrane technologies are being used in the life support system of the space flying vehicles, however, a more general approach to the potential place of the above processes in space technology is needed.

Future wider opportunities of using the membrane technology are determined by the following advantages: low sensitivity of the processes to reduced gravitation; possibility to accomplish several processes in one unit; susceptibility to external factors, such as magnetic, electric, thermal and other fields of forces which permits to intensify a process; possibility to use space factors, e.g. vacuum, radiation, etc.; possibility to make completely automatic module and cassette type equipment, etc.

One should pay attention to an increasing role of porous media in keeping and monitoring the material and energy flows in lower gravitation conditions.

It is attractive to use biomass as an industry raw material as it allows to reduce the sharp problem of irreproduction of some Earth resources and to produce a wide spectrum of organic and inorganic materials by ecologically clean method, besides concentration of some chemical elements by microorganisms reduces the "enthropy ability" of material production. High volume of biomass reproduction by means of microorganisms, however, gives rise to the new sources of environment contamination.

In the latter case one of the ways out of the problem is to use membrane technology and partially filtration. Membrane technology at the industial microbiological plants is able: 1) to control gas-exchange of technological systems with the environment, including liberation and concentration of various gas environment components (carbon dioxide, hydrogen, methane, etc.) by selective membranes; 2) to control water exchange with the environment, including nutrient exchange, extraction and disposal of the secondary products
from the liquid phase; 3) to concenrate and extract biomass and to return to a technological system of the liquid phase and nutrients.

Membrane technology provides for the soft conditions of processes that approach as much as possible to the level of their organization in the living nature where all vital functions are accomplished via semi-permiable biological membranes.

Semi-permiable membranes and microfilters are convinient elements for introduction and removal of components and products from a reaction zone during new compounds synthesis in gas and liquid phase media, as the mechanism of their action is not practically affected by lower gravitation and is determined by the laws of molecular and convectional diffusion.

Inorganic membranes can play an active role in monitoring the separation by means of their properties change, i.e. mass, electric, heat conductivity and others.

With some combinations of materials used to produce inorganic membranes, the system of worn-out membranes can be created in which a worn-out filter media of a higher purification grade can be used for the systems where the purification requirements are not so strict.

Thus the material used to make a inorganic membrane is successfully moved out of the purification systems with high requirements to the separation quality into the systems with less severe requirements. Worn-out filter material can also be used in other systems as porous or grain media of a filter. For example, the material of ceramic worn-out membranes can be used, as a raw material, to make a fine purification filter, then a coarse purification filter, as a charge for the deep bed filters; as a catalyst in the process of coating the ceramics by desired substances; as a filler for composites, as a sublayer for the ground in hydroponics, etc.