Solar-Institut Jülich

CERAMIC FILTER SYSTEMS

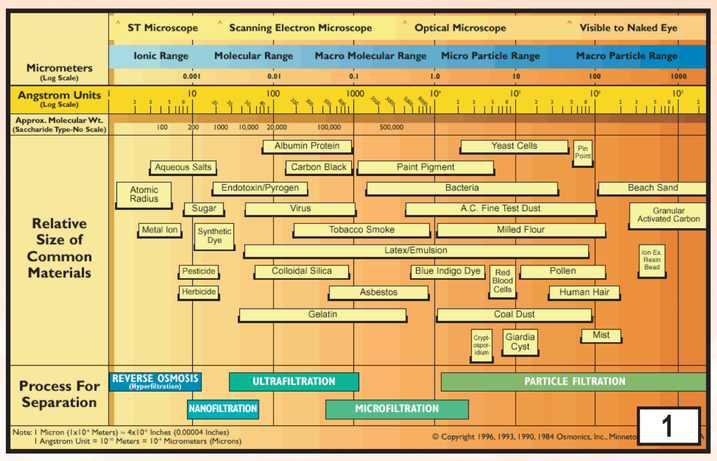
for Decentralized Water Treatment in Rural Areas

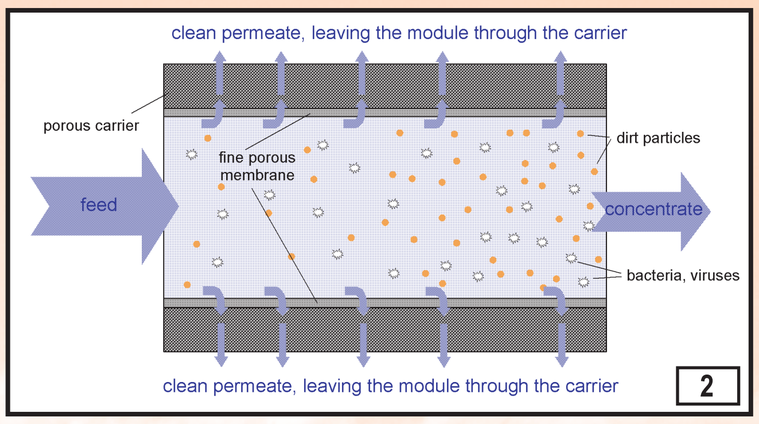
Background

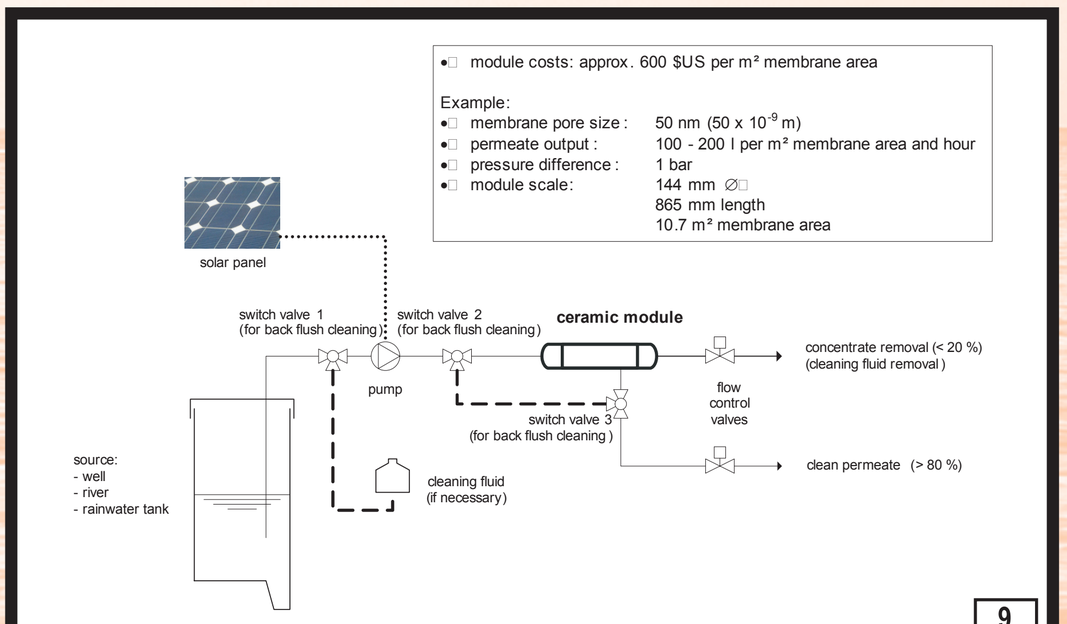
Continous supply of clean drinking water will be an increasing challenge in the coming decades. 1.2 billion people do not have access to clean drinking water. Numerous of developing countries as well as industrialized nations face increasing problems with respect to water quality and water supply costs. Several technical and preventive measures can be taken to reduce water demand and water contamination as well as to provide clean water even in rural areas.

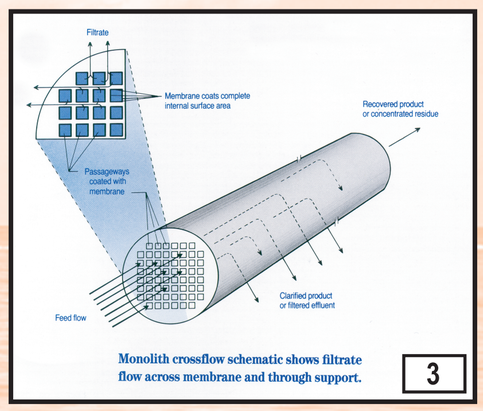
In principle several processes or even combination of them can be applied to clean water. One appropriate is membrane separation technology which is adopted more and more frequently.

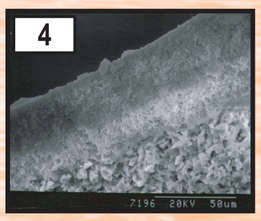
Fig. 1 gives an overview of several different impurities and their particle sizes and shows the different methods of membrane filtration.

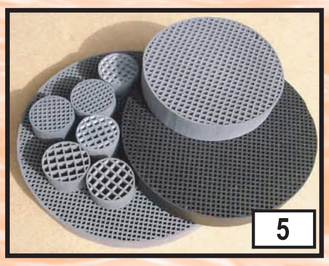












Material Advantages

– extremely durable
– very long life time
– inert against most chemicals
– easy to clean and sterilize
– less shrinking during firing
=> simple and cost effective production

Functional Principle

A membrane module consists of a carrier with relatively high permeability (Fig.4 bottom right) which is coated with a thin membrane layer of substantially lower permeability (Fig. 4 center). Substances which are larger than the pores of the membrane will be totally held back, while the smaller water molecules will pass as the purified permeate (Fig. 2).

In the presented technology a module is structured of numerous square channels which are coated at their internal surface with the membrane layer(s) (Fig. 3). The carrier consists of silicon carbide (SiC). The membrane can also be made of SiC down to pore size of 0.5 microns. For smaller particles (down to pore size of 0.005 microns) alumina or aluminium titanium oxide membranes are employed.

Modules can be produced in several geometries and scales (Fig. 5, 6 and 7).

Application Areas

Ceramic membrane filters could be used for the cleaning of untreated water coming out of
– wells,
– cisterns
– or rivers.

In this background membrane filters can serve for the seperation of
– solid dirt particles,
– bacteria
– and even viruses.

Concept

Decentralized drinking water generation can be achieved with the following simple set-up (Fig. 9):

– photovoltaic driven pump
– ceramic module with appropriate housing (Fig. 8)
– piping and few valves
– simple cleaning facility if necessary

Sponsors & Partners:

Bundesministerium für Bildung und Forschung

Federal Ministry of Research and Education (BMBF), Germany

STOBBE

Stobbe Tech Ceramics A/S, Denmark

CeraMem Corporation

CeraMem Cororation, USA

i+f process gmbh

i+f Process GmbH, Germany

IBEU
Ingenieurbüro
für Energie & Umwelt
Tuchbleiche 12
D-52428 Jülich-Barmen
Tel. +49 2461-54049
prof.kschwarzer@t-online.de

Solar-Institut Jülich
Fachhochschule Aachen
Heinrich-Mußmann-Str. 5
D-52428 Jülich
Tel. +49 2461-99-3532 Fax -3570
info-sij@fh-aachen.de
www.sij.fh-aachen.de