

What Actually is a Membrane?

My dictionary answers that question with “any thin pliable sheet of material” - but the true answer is much more complicated than that, certainly as far as filtration is concerned. In fact, the first membranes to be used widely in a separation process did not work by filtration at all, but by diffusion of water molecules through the material of the membrane, which had no physical holes in it.

The early membranes, in their sheet form, would have been thin and pliable, made from plastic materials, and would have been easily identified as such by any filtration technician. But so would very similar materials, also called membranes, whose function is to prevent the passage of water altogether, in the foundations of a house, for example, or under the soil in a horticulturist’s planting trough.

These completely impervious materials aside, all separation membranes are characterized by being permeable to water, at least, even if very high pressures are needed to force the water through the membrane material. The first major application of the semi-permeable polymeric membrane, the production of drinkable water from brackish waters using reverse osmosis, was very successful, and led to the development of new applications: ultrafiltration, and then nano- and microfiltration, and of newer materials: composite plastic membranes and membranes made from inorganic materials, such as ceramics.

As a result, the “membrane” is now any filter medium capable of filtering efficiently from around 1 μ m down to the nanometer level, and most likely to be made from a basic supporting layer carrying, on its upstream surface, a thin layer of semi-permeable material that actually does the separation, while being available in formats from the hollow plastic fiber through a multi-layer sintered wire mesh to a ceramic brick.

Ken Sutherland

Northdoe Limited

Keywords

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Filter and filtration processes

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