**The properties of polymeric and ceramic membranes for gas and liquid separation**

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Membrane technology plays an important role in various areas replacing or enriching the classical separation method. Since 1980s, membrane processes have become well-accepted in industry and medicine. The separation with the use of a membrane is based on the presence of a polymeric or inorganic barrier which splits the separated mixture into two effluents: the permeate, containing species transported preferentially through the membrane and the retentate, which contains the particles rejected by the membrane. A membrane phase (solid, liquid, or gaseous) introduces an interface between two other phases involved in the separation and acts as a permselective barrier.

The use of membranes is nowadays a part of the class of operations termed separation technology and in general, membrane processes are used for purification, concentration, fractionation, and distribution. The membrane is a key component of the separation system and its morphology is dependent on the final destination. In general, membranes can be classified according to different criteria such as a material used for the membrane preparation, membrane structure (morphology), methods of the membrane preparation, principle of separation, and the final application.

Paper will discuss various methods for optimizing membranes for given separation purposes, focusing mostly on membranes for gas separation and liquid-liquid separation by pervaporation. The goal of this optimization is to improve the affinity between membrane and separating systems. By merging material and membrane science, materials with adjusted morphology and controlled separation features can be prepared. The modification can be related to the adjustment of the surface nano-architecture and/or bulk membrane structure. Polymeric membranes with commercial and synthesized nanofillers will be described in detail. The surface modification of ceramic materials will be also discussed. Eventually, several practical applications of the pristine and modified membranes in gas separation and pervaporation will be presented.