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Measurement of permeability of low permeable membranes

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The determination of the permeability of low porous media like the micro and nanoporous membrane is still a challenge up to now. The low permeable membranes have several applications in vacuum technology, filtering, separation process, protection from shock waves and flow control. It can combine high mass flow rate and a high level of rarefaction. This property makes it particularly suitable as a leak element, by taking advantage of the constancy of conductance in free molecular regime, for example for calibration of ionization gauges or mass spectrometer [1]. Gas permeability is an important parameter to understand the transport characteristics of the porous media. This characteristic can be obtained from the mass or volume flow rate through a media. The proposed experimental methodology is based on the constant volume technique, which was initially developed for the isothermal and non-isothermal measurements of the mass flow rate through the microchannels [2]. In this work, we present an experimental technique allowing for step by step verification which allows for higher accuracy and shorter experiment time than the similar and commonly used method such as “pulse-decay” techniques [3]. We investigate permeability for a wide range of pressure and several gases, from continuum to free molecular regime.

References:

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