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Advancement in transient flow simulation: application to measurements of porous media permeability and tube conductance

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Investigations performed on gas flows at a microscale have become of great interest for various applications that touch almost every industrial field, such as mass flow and temperature micro sensors, micro pumps, micro-systems for mixing or separation for local gas analysis, mass spectrometers, pressure gauges, dosing valves and micro heat exchangers. Among these applications the gas flow through the low permeable membranes, which are also the flows at microscale, have also a great interest, especially in vacuum technology for filtering, separation process, protection and flow control. Recently some advancement in the transient flow simulation, based on the gas kinetic theory, was proposed in [1]. Using this approach, the experimental determination of the tube conductance is realized in [2]. The very similar approach is also proposed recently to characterize the permeability of the porous media like the low porous membranes. Different examples of the application of the proposed methodology are shown for various type of porous media et different gases.
References:
[1] F.Sharipov, I.Graur, General approach to transient flows of rarefied gases through long capillaries, Vacuum, v100, pp.22-25, 2014
[2] M. Rojas-Cardenas, E. Silva, M.-T. Ho, C. J. Deschamps, I. Graur, Time-dependent methodology for non-stationary mass flow rate measurements in a long micro-tube: Experimental and numerical analysis at arbitrary rarefaction conditions, I. Microfluid Nanofluid (2017) 21: 86

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