

Multiscale simulation of gas separation device based on thermal transpiration effect

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This paper presents numerical simulation of novel gas separation device utilizing membrane with temperature drop applied to its sides to induce thermal transpiration (Fig.1,2). To perform this simulation a new hybrid method was developed combining solution of Navier-Stokes equations at low Mach numbers at macroscale with solution of model Boltzman equation in membrane pores. Obtained results clearly indicate separation effect in such a device for three pairs of noble gases (He-Ar, He-Ne, Ne-Ar). Operation parameters for most effective separation had also been found.

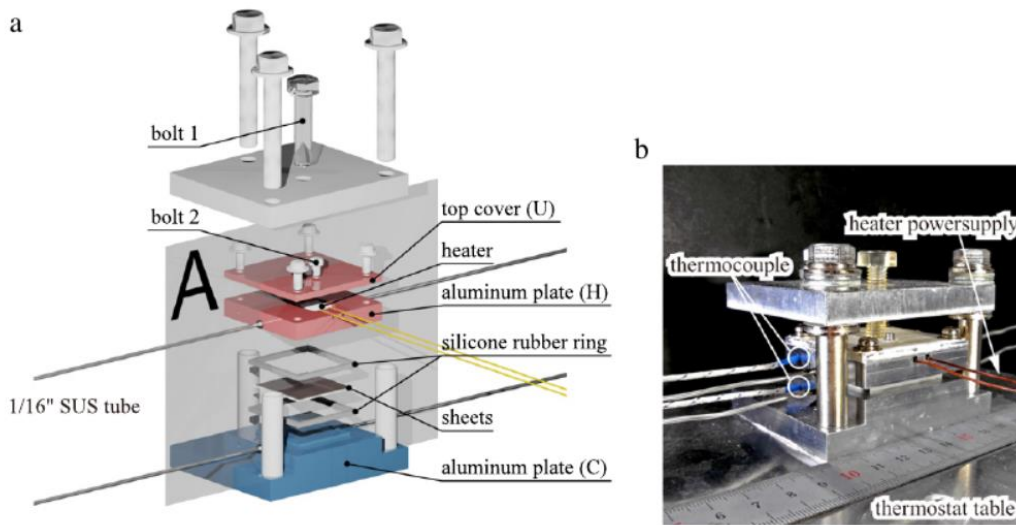


Figure 1. Schematic of gas separation device (a) and photograph of real prototype (b).

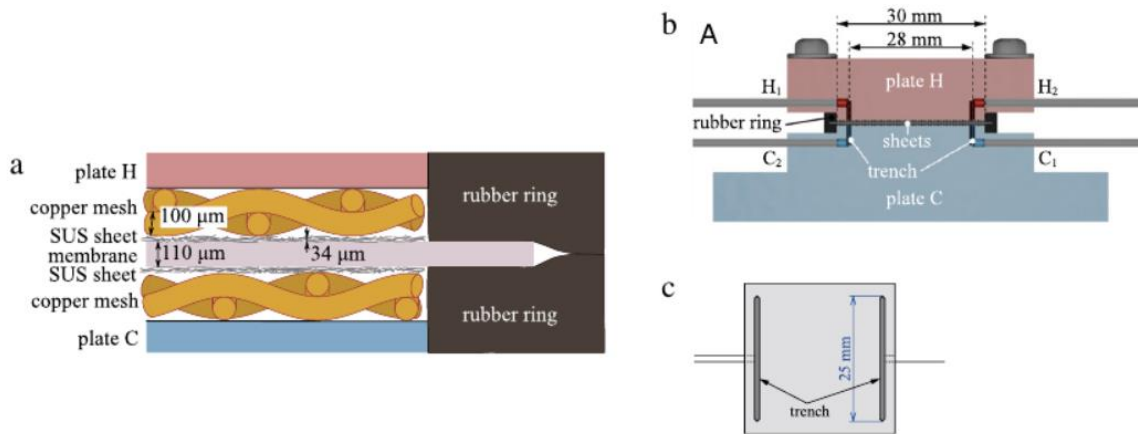


Figure 2. Sectional view of the device