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Evidence for Stochastic Switching of Transport through Molecular-Sieving Graphene Membranes LUDA WANG, Mechanical Engineering, University of Colorado at Boulder, Boulder, CO 80309, LEE DRAHUSHUK, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, STEVEN KOENIG, Graphene Research Centre, National University of Singapore, Singapore 117542, XINGHUI LIU, Mechanical Engineering, University of Colorado at Boulder, Boulder, CO 80309, MICHAEL STRANO, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, J. BUNCH, Department of Mechanical Engineering, Boston University, Boston, Massachusetts 02215, United States, SCOTT BUNCH TEAM, MICHAEL STRANO COLLABORATION — Two dimensional materials represent an emerging class of gas transport membranes capable of ultrahigh fluxes with molecular sieving potential. Herein, we study gas transport through atomically thin, monolayer graphene membranes open with a single (or several) molecularly sized, sub-nm pores by ozone activation and UV etching. We provide the first evidence for stochastic switching of permeance states through such membranes made from monolayer graphene during CO_2 transport. This switching is analyzed using a Hidden Markov Model to estimate the activation barriers of switching. Further evidence is provided using gold clusters formed on the surface of the graphene. Such clusters migrate and partially block the pore upon laser heating in vacuum. This work represents the first example of controlling gas phase transport through molecularly sized pores.

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