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**Influence of dopants on the impermeability of graphene** SAI SUNIL KUMAR MALLINENI, Clemson Univ, D.W. BOUKHVALOV, Hanyang University, I. S. ZHIDKOV, A. I. KUKHARENKO, A. I. SLESAREV, A. F. ZATSEPIN, S. O. CHOLAKH, Ural Federal University, APPARAO M RAO, Clemson Univ, S. M. SERKIZ, Savannah River National Laboratory, SRIPARNA BHATTACHARYA, Clemson Univ, E. Z. KURMAEV, M.N. Mikheev Institute of Metal Physics, RAMAKRISHNA PODILA, Clemson Univ — The effects of N-dopants on the impermeability of few-layered graphene (FLG) grown on copper using chemical vapor deposition will be presented. The grain boundaries in FLG have minimal impact on their permeability to oxygen as they do not provide a continuous channel for gas transport due to high tortuosity. However, we experimentally show that the N-dopants in FLG display multiple configurations (viz., graphitic, pyridinic, and pyrrolic) that create structural imperfections to selectively allow gas molecules to permeate. A comprehensive array of tools including Raman spectroscopy, X-ray photoelectron spectroscopy, optically stimulated electron emission measurements, and density functional theory of N-doped FLG were used to elucidate the effects of dopant configuration on the impermeability of graphene. Oxygen was found to permeate through FLG with non-graphitic nitrogen dopants that create pores in graphene and oxidize the underlying Cu substrate while graphitic nitrogen dopants did not show any changes compared to the pristine form.

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