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Stability and Passivation of Phosphorene Field Effect Transistors YEXIN DENG, ZHE LUO, Purdue University, XIANFAN XU, Purdue University, PEIDE YE, Purdue University — Phosphorene is a new 2D semiconducting material which has been intensively studied for its physical properties and potential device applications. Its high carrier mobility and thickness-dependent direct bandgap make its promising for high-performance field effect transistors and optoelectronic devices. However, even few layer phosphorene films are gradually degraded in air due to its irreversible chemical reactions with oxygen and water in ambient. In order to make stable phosphorene films for real device applications, we systematically studied the different passivation methods including PMMA, 2D hBN, and atomic layer deposited (ALD) dielectrics at different growth conditions. A combination of hBN and ALD could be one of the final solutions for realizing the environmentally stable phosphorene devices.

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