New study on low noise and high-performance transistors could bring innovations in electronics, sensing

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A research study on low noise and high-performance transistors led by Suprem Das, assistant professor of industrial and manufacturing systems engineering, in collaboration with researchers at Purdue University, was recently published by *Physical Review Applied*.

The study has demonstrated micro/nano-scale transistors made of two-dimensional atomic thin materials that show high performance and low noise. The devices are less than one-hundredth of the diameter of a single human hair and could be key to innovating electronics and precision sensing.

Many researchers worldwide are focusing attention on building the next generation of transistors from atomic scale "exotic" 2-D materials such as molybdenum di-selenide. These materials are promising because they show high-performance transistor-action that may, in the future, replace today's silicon electronics. However, very few of them are looking at yet another important aspect: the inherent electronic noise in this new class of materials. Electronic noise is ubiquitous to all devices and circuits and only worsens when the material becomes atomic thin.

A recent study conducted by Das' research team has systematically shown that if one can control the layer thickness between 10 and 15-atomic thin in a transistor, the device will not only show high performance—such as turning the switch "on"—but also experience very

low electronic noise. This unique finding is essential to building several enabling technologies in electronics and sensing using a number of emerging 2-D materials. This research is a comprehensive effort of a previous finding, where Das' team conducted the first study on noise in MoSe2 transistors.

More information: Jiseok Kwon et al, Correlating Electronic Transport and 1/ f Noise in MoSe2 Field-Effect Transistors, *Physical Review Applied* (2018). DOI: 10.1103/PhysRevApplied.10.064029

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