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Interface effect on multilayer tungsten disulfide device caused by substrate and water molecule XUE LIU, Tulane University, YUN LING, Jiangsu University, JIN HU, CHUNLEI YUE, ZHIQIANG MAO, JIANG WEI, Tulane University — We investigated field effect transistor (FET) device made of multilayered WS2 with Poly(methyl methacrylate) (PMMA) as the dielectric layer. The device was fabricated using shadow mask evaporation to improve contact. Comparing to the same FET with SiO2 dielectric layer, PMMA-WS2 device shows an excellent on-off ratio (up to 6 orders magnitude), an easily induced ambipolar behavior and a significantly reduced hysteresis at high gate voltage region during the gate sweep. Furthermore, we discovered that the water molecule absorbed onto the WS2 surface depletes the extra charge carriers at the neutrality point and transforms the device into insulating state at room temperature. In addition, we found that the effect caused by water absorption is reversible.

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