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## Development of Single Layer of WO3 on Large Spatial Resolution by Atomic Layer Deposition Technique

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**Abstract :** Unique and distinctive properties could be obtained on such two-dimensional (2D) semiconductor as tungsten trioxide (WO<sub>3</sub>) when the reduction from multi-layer to one fundamental layer thickness takes place. This transition without damaging single-layer on a large spatial resolution remained elusive until the atomic layer deposition (ALD) technique was utilized. Here we report the ALD-enabled atomic-layer-precision development of a single layer WO<sub>3</sub> with thickness of 0.77&plusmn;0.07 nm on a large spatial resolution by using (<sup>t</sup>BuN)<sub>2</sub>W(NMe<sub>2</sub>)<sub>2</sub> as tungsten precursor and H<sub>2</sub>O as oxygen precursor, without affecting the underlying SiO<sub>2</sub>/Si substrate. Versatility of ALD is in tuning recipe in order to achieve the complete WO<sub>3</sub> with desired number of WO<sub>3</sub> layers including monolayer. Governed by self-limiting surface reactions, the ALD-enabled approach is versatile, scalable and applicable for a broader range of 2D semiconductors and various device applications.

Keywords: Atomic Layer Deposition (ALD), tungsten oxide, WO3, two-dimensional semiconductors, single fundamental layer

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