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Laser Illumination Induced Superconductor-to-Semiconductor Phase Transitions in WS₂

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Description The ability to precisely manipulate crystal phase transitions in 2D TMDs is advantageous for controlling their physical properties and creating devices. In these TMD materials there has been noteworthy progress in achieving structural phase transitions between 2H and 1T or 1T' crystal phases. In WS₂, the 2M phase has been recently identified as an intrinsic 2D topological superconductor, with a notably high superconducting transition temperature of 8.8 K, and a semiconducting 2H phase. However, transitions between the 2M and 2H phases in WS₂, as well as other phases in 2D TMDs, remain poorly understood. In this study, we demonstrate local phase transitions from superconducting 2M to semiconducting 2H phases in WS₂ atomic layers via laser irradiation. Using scanning tunneling microscopy (STM), we find that the region exhibiting the 2H phase shows a hexagonal shape with a width of ~ 800nm ...

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