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Plasmonic Hot Electron Induced Structural Phase Transition in Monolayer MoS_2

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1. Introduction

The fascinating properties of molybdenum disulfide (MoS2) atomic layers have recently been found to support novel physics, such as valleytronics and the quantum Hall effect. The facile and potentially useful semiconducting (2H) to metallic (1T) phase transitions in MoS2 may be exploited as a means of controlling the electronic and optical properties of devices based on this material. The ability to actively control and induce this phase transition by optical means would enable the further development of such applications. By using Raman scattering and photoluminescence within ultra-vacuum and low temperature environment, here we demonstrate that hot electrons generated by plasmonic Au nanoparticles can induce a 2H-to-1T phase transition in a single MoS2 layer. Our finding that plasmonic hot electrons can induce phase transitions in nearby low-dimensional materials opens up new possibilities for the development of optoelectronic devices.

Appendix

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