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Suspended Molybdenum Disulfide Field Effect Transistors FENGLIN WANG, PETR STEPANOV, MASON GRAY, CHUN NING LAU, Department of Physics and Astronomy, University of California, Riverside — We fabricate suspended molybdenum disulfide (MoS_2) field effect transistors (FET) devices and develop an effective gas annealing technique that significantly improves device quality and increases conductance by 3-4 orders of magnitude. Mobility of the suspended devices ranges from 0.01 to 10 cm^2/Vs before annealing, and 0.5 to 85 cm^2/Vs after annealing. Temperature dependence measurements reveal two transport mechanisms: electron-phonon scattering at high temperatures and thermal activation over a gate-tunable barrier height at low temperatures. Our results suggest that transport in these devices is not limited by the substrates, but likely by defects, charge impurities and/or Schottky barriers at the metal-MoS_2 interfaces. Finally, this suspended MoS_2 device structure provides a versatile platform for other research areas, such as thermal, optical and mechanical studies.

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