replacing MAR16-2015-000642 Abs

for the MAR16 Meeting of
The American Physical Society

Metal to insulator quantum-phase transition in few-layered ReS_2.[1] NIHAR PRADHAN, NHMFL, Tallahassee, FL-32310, USA, AMBER MCCREARY, Dept. of Physics,Penn State University, PA 16802, USA, DANIEL RHODES, ZHENGUANG LU, DMITRY SMIRNOV, EFSTRATIOS MANOUSAKIS, NHMFL, Tallahassee, FL-32310, USA, SIMIN FENG, Dept. of Physics,Penn State University, PA 16802, USA, RAJU NAMBURU, MADAN DUBEY, U.S. Army Research Laboratory, Adelphi, MD 20783, USA, ANGELA HIGHT WALKER, NIST, Gaithersburg, MD 20899, USA, HUMBERTO TERRONES, Dept. of Physics, RPI, NY 12180, USA, MAURICIO TERRONES, Dept. of Physics,Penn State University, PA 16802, USA, VLADIMIR DOBROSAVLJEVIC, LUIS BALICAS, NHMFL, Tallahassee, FL-32310, USA — ReS_2 a layer-independent direct band-gap semiconductor of 1.5 eV implies a potential for its use in optoelectronic applications. Here, we present an overall evaluation of transport and anisotropic Raman of few-layered ReS_2 FET. ReS_2 exfoliated on SiO_2 behaves as an n-type semiconductor with an intrinsic carrier mobility surpassing μ_i ~30 cm^2/Vs at $T = 300$ K which increases up to ~350 cm^2/vs at 2 K. Semiconducting behavior is observed at low electron densities n, but at high values of $n$the resistivity decreases by a factor >7 upon cooling to 2 K and displays a metallic T^2-dependence. The electric-field induced metallic state observed in MoS_2 was recently claimed to result from a percolation type of transition. Instead, through a scaling analysis of the conductivity as a function of $T$and n, we find that the metallic state of ReS_2 results from a second-order metal to insulator transition driven by electronic correlations.

[1]Supported by U.S. Army Research Office MURI Grant No. W911NF-11-1-0362

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Date submitted: 29 Oct 2015 Electronic form version 1.4