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Mobility Enhancement and Highly Efficient Gating of Monolayer MoS_2 Transistors with Polymer Electrolyte MING-WEI LIN, LEZHANG LIU, QING LAN, XUEBIN TAN, KULWINDER DHINDSA, PENG ZENG, Wayne State University, VAMAN NAIK, University of Michigan-Dearborn, MARK MING-CHENG CHENG, ZHIXIAN ZHOU, Wayne State University, WAYNE STATE UNIVERSITY COLLABORATION, UNIVERSITY OF MICHIGAN-DEARBORN COLLABORATION — We report electrical characterization of monolayer molybdenum disulfide (MoS_2) devices using a thin layer of polymer electrolyte consisting of poly(ethylene oxide) (PEO) and lithium perchlorate ($LiClO_4$) as both a contact-barrier reducer and channel mobility booster. We find that bare MoS_2 devices (without polymer electrolyte) fabricated on Si/SiO_2 have low channel mobility and large contact resistance, both of which severely limit the field-effect mobility of the devices. A thin layer of PEO/ $LiClO_4$ deposited on top of the devices not only substantially reduces the contact resistance but also boost the channel mobility, leading to dramatically enhancement of the field-effect mobility of the device. When the polymer electrolyte is used as a gate medium, the MoS_2 field-effect transistors exhibit excellent device characteristics such as a near ideal subthreshold swing and an on/off ratio of 10^6 as a result of the strong gate-channel coupling.

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