Abstract Submitted
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Electric Field-Dependent Photoluminescence in Multilayer Transition Metal Dichalcogenides[1] T. K. STANEV, A. HENNING, V. K. SANGWAN, N. SPEISER, N. P. STERN, L. J. LAUHON, M. C. HERSAM, Northwestern University, K. WANG, D. VALENCIA, J. CHARLES, T. C. KUBIS, Purdue University — Owing to interlayer coupling, transition metal dichalcogenides (TMDCs) such as MoS_2 exhibit strong layer dependence of optical and electronic phenomena such as the band gap and trion and neutral exciton population dynamics. Here, we systematically measure the effect of layer number on the optical response of multilayer MoS_2 in an external electric field, observing field and layer number dependent emission energy and photoluminescence intensity. These effects are studied in few (2-6) and bulk (11+) layered structures at low temperatures. In MoS_2 the observed layer dependence arises from several mechanisms, including interlayer charge transfer, band structure, Stark Effect, Fermi level changes, screening, and surface effects, so it can be challenging to isolate how these mechanisms impact the observables. Because it behaves like a stack of weakly interacting monolayers rather than multilayer or bulk, ReS_2 provides a comparison to traditional TMDCs to help isolate the underlying physical mechanisms dictating the response of multilayers.

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