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Quasi 2D electronic states with high spin-polarization in centrosymmetric MoS_2 bulk crystals L PLUCINSKI, M. GEHLMANN, PGI-6, FZ Juelich, G. BIHLMAYER, I. AGUILERA, PGI-1, FZ Juelich, E. MLYNCZAK, M. ESCHBACH, S. DÖRING, P. GOSPODARIC, PGI-6, FZ Juelich, B. KARDYNAL, PGI-9, FZ Juelich, S. BLÜGEL, PGI-1, FZ Juelich, C. M. SCHNEIDER, PGI-6, FZ Juelich — Time reversal dictates that nonmagnetic, centrosymmetric crystals cannot be spin-polarized. However, it has been recently shown that the electronic structure in these crystals can in fact show a high spin-polarization, as long as it is probed locally in real and in reciprocal space [1]. We present the first observation of this type of compensated polarization in MoS_2 bulk crystals. Using spin- and angle-resolved photoemission spectroscopy we directly observed a spin-polarization of more than 65% for distinct valleys in the electronic band structure. By additionally evaluating the probing depth of our method we find that these valence band states at the K point in the Brillouin zone are close to fully polarized for the individual atomic trilayers of MoS_2, which is confirmed by our density functional theory calculations. Furthermore, we show that these states are almost completely confined within two dimensions. Our findings prove that these highly desired properties of MoS_2 can be accessed without thinning it down to the monolayer limit. Our results are accessible at the pre-print server: M. Gehlmann et al., arXiv:1510.04101 (2015). [1] X. Zhang, Q. Liu, J.-W. Luo, A. J. Freeman, and A. Zunger, Nat. Phys. 10, 381 (2014).

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