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Enhanced valley polarization in 3R-MoS_2 RYUJI SUZUKI, YUI-JIN ZHANG, YOSHIHIRO IWASA, The University of Tokyo — Transition-metal dichalcogenides (TMDs) are growing interest as graphene-like layered materials and have rich physical properties including spin/valley physics. Since the spin/valley degeneracy is resolved, inversion symmetry breaking is necessary, and then researchers mainly focused on monolayer TMDs, which has NO inversion symmetry. The size of monolayer, however, is 30um at maximum in the lateral size. This is not sufficient for deepening spin/valley physics. On the other hand, 2H bulk crystal, a famous bulk polytype, has inversion symmetry. Hence, noncentrosymmetric bulk crystals are desired. Here we introduce 3R bulk crystal of MoS_2 as a new promising material for spin/valley physics. 3R polytype is composed of a trilayer stacking in such a way that the inversion symmetry is kept broken in the bulk form. Using 3R-phase, we observed the enhanced valley polarization through circular polarized photoluminescence measurements in the bilayer form. The degree of polarization P of 3R bilayer reached 68% at 4K, whereas the 2H form showed P = 33 % at most. The temperature dependency also indicated P of 3R is about twice as large as 2H of all temperature range (4K $\sim$ 300K). The noncentrosymmetric 3R MoS_2 is promising for pushing forward valley/spin-tronics based on 2D crystals.

Ryuji Suzuki
The University of Tokyo

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