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Spin tunneling in two-dimensional transition-metal dichalcogenide layers ZHENG YANG, BO HSU, SUBHAJIT GHOSH, GETU GEBRE, University of Illinois at Chicago, YANG RESEARCH GROUP TEAM — The spin tunneling effect are studied using magnetic tunneling junctions (MTJs) with two-dimensional (2D) transition-metal dichalcogenide MX_2 (M=Mo, W; X=S, Se) monolayers as the tunnel layers. The single-crystalline 2D MX_2 monolayers were grown using chemical vapor deposition. As-grown 2D MX_2 were transferred and fabricated into MTJ devices using lithography process. Ferromagnetic metals Co and permalloy were employed as top and bottom layers in the MTJ devices. In this presentation, the spin valve effect at low- and room-temperatures is reported; the temperature dependence and bias dependence of spin tunneling effect are reported; the layer dependence of the spin tunneling effect is reported; the annealing effect on the MTJ device is reported; antiferromagnetic-layer (such as PtMn) coupling effect in the MTJ devices is reported. Finally, the performance of MTJ devices based on MoS_2, WS_2, $MoSe_2$, and WSe_2 are compared.

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