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Strain engineering of topological edge states in MoX_2 (X=S, Se, Te) nanoribbons with 1T' phase HA-JUN SUNG, Korea Advanced Institute of Science and Technology, DUK-HYUN CHOE, Rensselaer Polytechnic Institute, KEE JOO CHANG, Korea Advanced Institute of Science and Technology — Two-dimensional topological insulators are known as quantum spin Hall (QSH) insulators, in which backscattering is completely forbidden for edge states. Recently, layered transition metal dichalcogenides (TMDs), MX_2 (M=Mo, W and X= S, Se, Te), with a 1T' structure have been predicted to be QSH insulators. For room-temperature operation of QSH devices without dissipation in transport, large band gaps are desired and the topological edge states should be located within the band gap. Therefore, it is interesting to see whether the topological edge states in one-dimensional nanoribbons of 1T'-MX_2 actually exhibit the desired electronic properties. A further question is how the electronic structure can be modified by using an external parameter such as strain. Here we report the tunability of the topological edge states by applying strain in 1T'-MoX_2 nanoribbons. The bulk gaps can reach up to 167, 228, and 362 meV under strain for X= S, Se, and Te, respectively. Although the location of the Dirac point depends on the chalcogen species, we show the possibility of tuning the Dirac point in the band gap by applying compressive or tensile strain. Considering the size of band gap and the amount of strain, we suggest that $MoSe_2$ nanoribbons would be the best candidate for QSH devices.

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