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Superconductivity in atomically thin WS_2 from Migdal-Eliashberg study[1] APPALAKONDAIAH SAMUDRALA, E. H. HWANG, SKKU Advanced Institute of Nanotechnology (SAINT), Sungkyunkywan University, Suwon-16419, Republic of Korea., E. H. HWANG TEAM — Recently, the possibility of extrinsic superconducting properties and enhancement of the critical temperature (T_c) have been widely studied in two dimensional materials such as graphene, phospherene, MoS_2 etc. This process includes several approaches such as applying intercalation/adsorption of metal atoms, carrier doping, strain and electric fields to thin 2D materials. In this work, we consider the effects of carrier doping on stability, electron-phonon, and superconductivity of atomically thin WS_2. For this, ab initio calculations were performed using Migdal-Eliashberg theory with the combination of Wannier interpolation. From our results, the pristine single layer WS_2 is a direct band semiconductor with similar electronic properties of MoS_2. Employing carrier doping makes WS2 have the metallic nature, and doping enhances the electron-phonon coupling strength(from $\alpha^2F(\omega)$) is from 0.3 to 1.5 as doping levels change from 0.02 to 0.10 per formula unit. This trend gives rise to the enhancement of superconducting T_c from 2K to above 10K by electron doping. Overall, present results indicated that the approximate tuning of electronic band structure results possibility of phonon mediated supercomputing properties in atomically thin single layer WS_2.

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