Polarity control of 2D TMDC via plasma doping

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? Doping method, which can change properties ofmaterials, has been steadily developed and adapted very well in experiments. However, as atomically thin materialssuch as two-dimensional materials (2D) have been developed, some methods thatcan be applied to three-dimensional materials such as ion implantation face limitations.Thus a new method for effectively doping 2D materials is required and plasmadoping has been studied as a feasible method. If plasma is applied to treat 2D materials,it has advantages as a uniform, large-scaled and nondestructive treatment atroom temperature. Particularly, it is found that plasma doping of semiconductingtransitionmetal dichalcogenides (TMDC) enables itspolarity control.

Therefore, in this work, we carried out plasma dopingusing nitrogen and oxygen gas on 2D TMDC such as tungsten diselenide (WSe_2)and molybdenum ditelluride ($MoTe_2$) and investigated their polaritychange by comparing their work functions between Kelvin probe force microscopy(KPFM) and field effect transistor (FET) I-V curve characteristics. Inconclusion, we observed tendency for matched KPFM and FET characteristicsresult by getting work function and Fermi energy from the two results. Thisstudy will be effectively utilized to controlling potential value and polaritycontrol on 2D TMDC in the future.

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