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Suspended MoS2 devices TAIYU JIN, JINYOUNG KANG, RENLONG LIU, YOUNGCHAN KIM, CHANGGU LEE, Sungkyunkwan University — Single or a few layer MoS2 sheets have been reported to have high electric mobility and current on/off ratio comparable to those of silicon due to its semiconductor properties with bandgap of 1.3 $\sim$ 1.9eV. However, its extremely high surface to volume ratio and low thickness prohibits it from reproducing its electronic properties on SiO2 substrates possibly because of charge scattering by surface charges and phonons. In order to investigate these surface effects, we fabricated MoS2 devices suspended from the SiO2 and characterized their electronic transport properties. We exfoliated single or a few layer MoS2 on SiO2 substrates first, and fabricated field effect transistors using e-beam lithography. After that, we suspended MoS2 sheets by etching SiO2 with hydrofluoric acid. We measured mobility and current on/off ratio before and after the etching process. We found that mobility of MoS2 devices increased by factor of 5-10 after etching for all devices. However, on/off ratio did not show significant variation. Our measurements suggest that atomically thin MoS2 devices are significantly affected by substrate surface and environment.

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