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Exciton Dynamics on Suspended and Substrate-supported MoS_2 and WS_2 Monolayers.[1] CHAO XU, YILING YU, YIFEI YU, ANDY BARRETTE, LINYOU CAO, KENAN GUNDOGDU, North Carolina State University, KENAN GUNDOGDU TEAM, LINYOU CAO TEAM — MoS_2 and WS_2 monolayers are promising atomic-scale platform for novel light emission devices, however, despite perfect surface passivation and strong exciton binding energy, their luminescence efficiencies are very low. Here, through the observation of exciton dynamics by ultrafast transient reflection, we revealed that the substrate can affect the exciton dynamics on MoS_2 and WS_2 monolayers, by facilitating the non-radiative recombination pathways, thus reducing the luminescence efficiency. Furthermore, strong many-body interactions such as exciton-exciton annihilation, are enhanced on suspended MoS_2 and WS_2 monolayers, whereas the defects in substrates may efficiently quench excitons thus mitigate those effects.

[1]North Carolina State University

Chao Xu
North Carolina State Univ

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