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Title of the Presentation: Controllable graphoepitaxy for the large scale growth of perovskite nanowire arrays

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Short Biography:

Chun Li received his B. Eng. degree at Peking University, China, in 2018. He is currently a master candidate in the group of Prof. Qing Zhang at Department of Materials Science and Engineering of Peking University. His research interests are focused on the development of low-dimensional perovskite nanostructures for optoelectronic applications.

Abstract:

Cesium halide bromide ($CsPbBr_3$) has drawn wide attentions in the field of advanced optoelectronic applications due to excellent emission efficiency and unique environmental stability among perovskite family [1, 2]. In this talk, I will introduce our recent results on graphoepitaxy of large-scale $CsPbBr_3$ nanowire (NW) array induced by surface grooves on muscovite mica (001) [3]. Through high-resolution atomic force microscopy, we proved the tetrahedral distortion induced unidirectional grooves along the [100] direction on freshly exfoliated muscovite, which facilitated the graphoepitaxy of millimeter-scale $CsPbBr_3$ NW arrays, aligned along the surface grooves via chemical vapor deposition (Fig. 1). Increasing the surface temperature to 520℃ overcame the groove barrier, leading to a typical van der Waals tri-directional growth model following the quasi-hexagonal lattice of muscovite mica. The optical spectra suggested that the $CsPbBr_3$ NWs exhibited good optical quality and emission anisotropy without imperfections. Our findings unravel the surface reconstruction of muscovite (001) as a modulation for anisotropic heteroepitaxy, and elucidate the feasible growth of large-scale low-dimensional structures for anisotropic optoelectronics.

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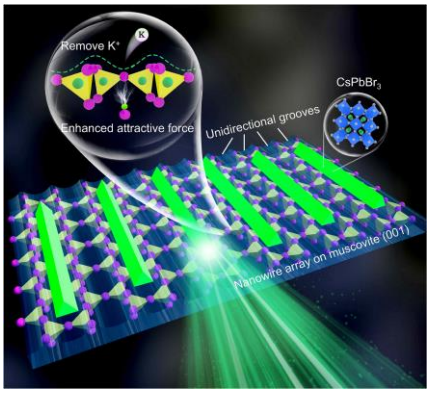

Fig. 1. Schematic of $CsPbBr_3$ nanowire array on muscovite mica (001) driven by surface grooves.

[1] Y. Gao et al., Adv. Mater. 30, 1801805 (2018).
[2] Q. Shang et al., Nano. Lett. 20, 1023 (2020).
[3] C. Li et al., Adv. Opt. Mater. 8, 2000743 (2020).