The large-scale organization of nanowires with controlled orientation on surfaces remains a major obstacle toward their large-scale integration into functional devices. During the last few years we have reported the growth of aligned horizontal nanowires and nanowire-heterostructures of various semiconductors including ZnSe, ZnTe, CdSe, CdS, core-shell ZnSe@ZnTe and CsPbBr3 with controlled crystallographic orientations on different planes of sapphire. We exploit surface-material interactions, either epitaxial or graphoepitaxial, to guide horizontal nanowires during their growth into well-organized assemblies. Here we show how the nanowire arrays are easily integrated into optoelectronic devices in a simple and parallel manner. The performance of fast photodetectors and photovoltaic devices based on surface-guided horizontal NWs demonstrates the potential of the surface-guided approach to achieve bottom-up assemblies of nanowires with complex structures and controlled optoelectronic properties.

**Keywords:** Perovskite, Assembly, Epitaxy

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