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Abstract

While there is considerable interest in zinc oxide nanomaterials for optoelectronics research, one weakness of the material is the difficulty in producing p-type zinc oxide. This can be attributed to a number of factors such as acceptor instability, donor compensation during growth, and the formation of deep acceptors. Recently, it was discovered that antimony is a stable p-type dopant in hydrothermally grown ZnO nanowires, and this method has been modified to produce ultra-long nanowires and homojunction thin films. In order to broaden the applicability of this new material, it is important to investigate how it interacts with other semiconducting nanomaterials. In this work we demonstrate a solution grown p-ZnO/n-Si nanowire heterojunction. After investigating its basic materials properties, we show its applicability as an photodetector with responsivity as high as 1.02 A/W at 442 nm, an order of magnitude higher than similar nanostructures based on n-type ZnO and p-type Si.