Broadband Photodetector Using Organic - Inorganic Perovskite With Hole Blocking Material

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Photodetectors are used in a wide range of fields such as optical communication, medical, information processing, industrial safety and precision control. Organic-inorganic perovskite materials are suitable for optoelectronic device applications. They have direct band-gap, large absorption coefficient, low exciton binding energy, long charge diffusion length, high charge carrier mobility and solution porcessability, optical-gap tenability. Most of the above properties of the perovskite material have the advantage of being applicable to broadband photodetectors. These properties induce high specific detectivity, large linear dynamic range and high response frequency. However, the property of low exciton binding energy can also adversely affect photodetector performance, particularly responsivity and detectivity. This property can make exciton to easily separate and induce high dark-current which makes the low responsivity and detectivity in ambient condition. We used a very thin PEI (polyethyleneimine) layer as the hole barrier layer to lower the dark current. Therefore, we can manufacture perovskite photodetectors with high responsivity and detectivity.