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Highly Sensitive Photodetector Based on a Self-assembled Organic Single Submicrometer Ribbon JIAN WANG, YAN ZHOU, LEI WANG, South China University of Technology, JIAN PEI, Peking University — We demonstrated a highly sensitive air-stable photodetector based on a single submicrometer organic crystalline ribbon self-assembled from a condensed benzothiophene via solution process. The low cost and simple solution process was employed in the device fabrication process from the submicrometer ribbons preparation to the deposition on the substrate. The photoconductivity gain is up to 1.3×10^3 , while the responsivity is about 420 A/W at the field of 2×10^4 V/cm. The highest on/off ratio reaches around 1000. The performance is comparable to that of photodetectors based on inorganic nanowires, and even better than those based on carbon nanotube or other bilayer molecular self-assembled nanotubes. In addition, the photo-switching properties to those organic photodetectors were investigated with different metal electrodes. The results show that the surface states created by the thermal evaporation of the heavy gold atoms are responsible for the high photo gain and the slow photocurrent decay. To our best knowledge, this is the first report on photodetectors based on crystalline organic 1D submicrometer ribbons self-assembled via solution process, which combine both advantages of intrinsic properties of the 1D crystalline structure and the simplicity of the solution process.

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