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Electrochemical Photocurrent Enhancement in a ZnO-Perovskite Heterojunction Using Piezoelectric Effect

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Abstract- ZnO is a candidate material to be used as the electron transport layer in flexible perovskite solar cells. However, the energy structure at the ZnO-perovskite heterojunction introduces an energy barrier affecting the photocurrent in a device. Here, we report on enhancing the photocurrent in a zinc oxide nanowire (NW)-perovskite heterojunction by employing the piezoelectric effect in NWs. The heterojunction was fabricated on an indium tin oxide coated flexible substrate. The effect of the piezoelectric charges on the photoelectric response of the heterojunction was studied in an electrochemical cell under different bending curvatures of the substrate. Employing piezoelectric effect, the photocurrent of the sample was increased by 46% from the flat state to the maximum outward curvature of 1.02 cm^{-1}. Scanning electron microscopy (SEM), X-ray diffraction (XRD), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were performed to characterize the sample. The EIS study was performed for a sample at flat and bent states in both dark and light conditions. Based on the results an equivalent circuit model was suggested. Change in the values of the components in the