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Charge Transfer Mechanism of Electrically Bistable Switching Devices based on Polyimide

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Charge transfer mechanism of poly(4,4'-aminotriphenylene hexafluoroisopropylidenediphthalimide) (TP6F PI) which exhibits bistable ON and OFF switching has been studied using photoemission electron spectroscopy (PES) and near-edge x-ray absorption fine structure (NEXAFS). Here, we demonstrate novel set-up in which holes are injected by photoemission process instead of direct charge carrier injection via metal electrode. The accumulated charges on the PI surface in the OFF state abruptly flow across the PI film when the bias voltage of a back electrode reaches a specific value, indicating that the film is changed to the ON state. Core level and x-ray absorption spectra probed at charge injection region via photoemission process do not show any evidences implying structural modification of TP6F PI during the phase change. Whereas, in valence band spectra, the highest occupied molecular orbital (HOMO) is shifted toward Fermi level, responsible for improved hole-mobility of TP6F PI of ON state.