Bifacial Perovskite Photodetectors under Xenon Ion Irradiation

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Abstract:
This study presents a thorough examination of bifacial perovskite photodetectors (BPPDs) subjected to xenon ion irradiation at an energy of 1.75 MeV per nucleon (231 MeV) with fluences reaching 10^{11} nucleons cm^{-2}, mimicking the extreme radiation levels encountered in space or other harsh environments. The investigation covers both pre- and post-irradiation conditions, with comprehensive characterization of the device components, including the glass substrate, transparent contacts, charge-transport interfaces, and the perovskite light-absorbing layer. Performance metrics such as responsivity, external quantum efficiency, linear dynamic range, detectivity, noise equivalent power, and temporal response are systematically evaluated. The findings reveal that at lower ion fluence (10^{10} nucleons cm^{-2}), the detectors maintain stable performance, highlighting their resilience to radiation damage. In contrast, higher fluence levels (10^{11} nucleons cm^{-2}) lead to noticeable, though not catastrophic, performance losses attributable to irradiation-induced defects in the active layers. The demonstrated combination of bifacial operation and strong radiation hardness positions BPPDs as promising candidates for next-generation optoelectronic technologies designed to function reliably in radiation-rich settings [1-2].

Conflicts of Interest
The authors declare that there is no conflict of interest.

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