Tech Science Press

ICCES, 2024, vol.29, no.1
DOI: 10.32604/icces.2024.010900

PROCEEDINGS

Split-Ring Structured All-Inorganic Perovskite Photodetector Arrays for Human-Machine Interaction

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ABSTRACT

Photodetectors with long detection distances and fast responses are important media in constructing a non-contact human-machine interface for the human-machine interaction. All-inorganic perovskite have excellent optoelectronic performance with high moisture and oxygen resistance, making them one of the promising candidates for high-performance photodetectors, but a simple, low-cost and reliable fabrication technology is urgently needed. Here, a dual-function laser etching method is developed to complete both the lyophilic split-ring structure and electrode patterning. This novel split-ring structure can capture the perovskite precursor droplet efficiently and achieve the uniform and compact deposition of $CsPbBr_3$ films. Furthermore, our devices based on laterally conducting split-ring structured photodetectors possess outstanding performance, including the maximum responsivity of 1.44×10^5 mA/W, a response time of 150 μs in 1.5 kHz and one-unit area < 4×10^{-2} mm^2. Based on these split-ring photodetectors array, we realized three-dimensional gesture detection with up to 100 mm distance detection and up to 600 mm/s speed detection, for low-cost, integrative, and non-contact human-machine interfaces. Finally, we applied this device to wearable and flexible digital gesture recognition watch panel, safe and comfortable central control integrated on the car screen, and remote control of the robot, demonstrating the broad potential applications.

KEYWORDS

Split-ring; dewetting; perovskite photodetector array; human–machine interface

Acknowledgement: X Zhang, G Yang, and Q Liao acknowledge the support from Harvard/MIT.

Funding Statement: The Key Research Project of Zhejiang Laboratory (N.O. 2021PE0AC02), the National Natural Science Foundation of China (N.O. 11674210) and the Project of Hetao Shenzhen-Hong Kong Science and Technology Innovation Cooperation Zone (HZQB-KCZYB-2020083).

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.