Microtransfer Printing Of Al_2O_3-passivated SWIR-PbS QDs Photoconductors

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Target:

Towards wafer-scale integration of air stable QDs on commercial silicon read-out integrated circuits.

Challenges:

- Facile, localized QD film patterning
- Long life-time photostability

Transfer Printing Approach:

Selective pick-and-print of Al_2O_3 passivated QD assemblies on device structures with high precision.

Transfer Printing Process Flow

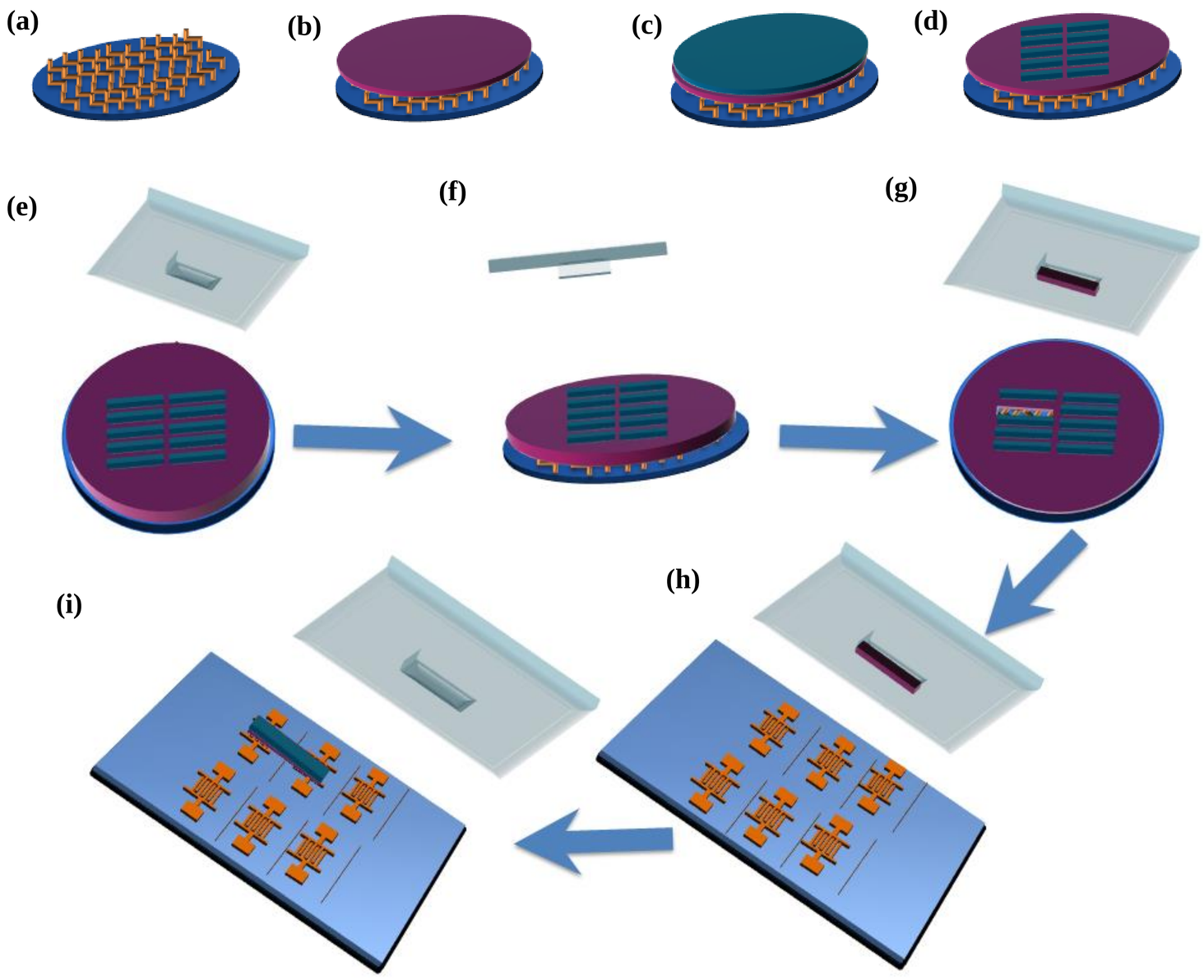

Fig.1 (a-d) **Source substrate preparation**, including ODTS-Si preparation, QDs spin coating and ALD-Al_2O_3 encapsulation. (e-i) **Pick-and-Print** of Al_2O_3/PbS patches on interdigitated electrodes on an oxidized Si wafer

Scalability

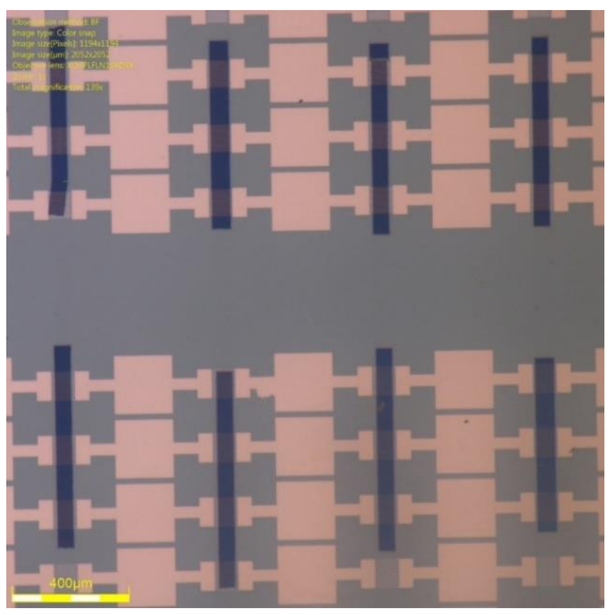

Fig.2 Integrated Arrays of printed Al_2O_3@$PbS_{2.1µm}$ QD photoconductors

Al_2O_3@$PbS_{2.1µm}$ QD photoconductor characterization

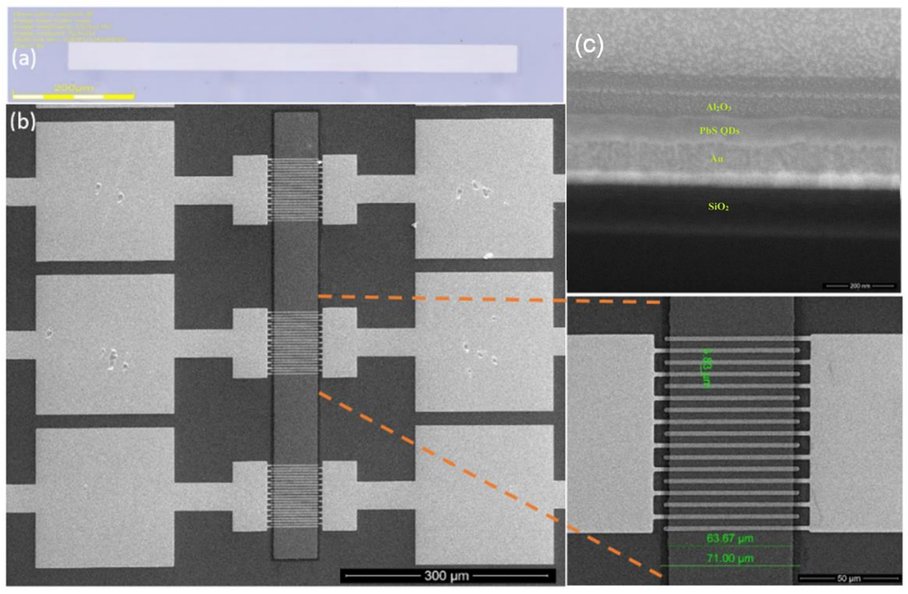

Fig.3 (a) optical image of the source substrate after pattern pick-up, (b) Printed Al2O3/PbS QD photoconductor, and (c) cross section.

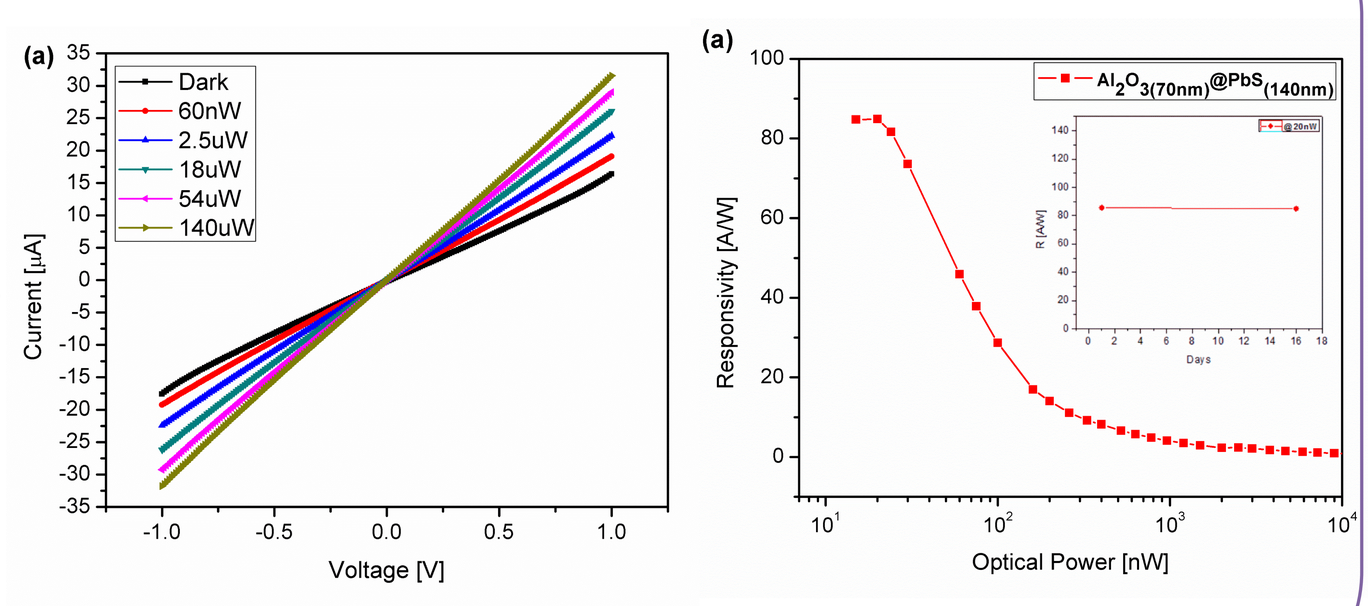

Fig.4 (a) IV characteristics in dark and under surface illumination at 2.1 µm, and (b) corresponding responsivity and (inset) life-time stability

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