

CLAIMS

What is claimed is:

1. A system comprising:
 - an image sensor structure comprising:
 - an image layer disposed over a base substrate,
 - a device stack disposed over the image layer,
 - a bond pad disposed in the device stack,
 - a passivation stack disposed over the device stack and the bond pad,
 - an array of nanowells disposed in a top layer of the passivation stack,
 - a through-silicon via (TSV) in electrical contact with the bond pad, the TSV extending through the base substrate, and
 - a redistribution layer (RDL) disposed on a bottom surface of the base substrate, the RDL in electrical contact with the TSV; and
 - a flow cell disposed upon the top layer of the passivation stack to form a flow channel therebetween;
 - wherein the flow channel is disposed over the array of nanowells and extends over the bond pad;
 - wherein the passivation stack is disposed between the flow channel and the bond pad.
2. The system of claim 1, comprising:
 - a first (1st) environmental protection layer disposed over a 1st portion of the RDL;
 - mechanical support structures disposed over the 1st environmental protection layer; and
 - wires bonded in electrical contact to a second (2nd) portion of the RDL.
3. The system of claim 2, comprising:
 - a 2nd environmental protection layer disposed over the 2nd portion of the RDL;
 - wherein the 1st and 2nd environmental protection layers cover the entire RDL.

4. The system of claim 1, wherein the bond pad is a plurality of bond pads over which the flow channel is disposed.
5. The system of claim 1, wherein the passivation stack comprises:
 - a 1st passivation layer disposed over the device stack and the bond pad; and
 - a 1st chemical protection layer disposed over the 1st passivation layer.
6. The system of claim 5, wherein the passivation stack comprises:
 - a 2nd passivation layer disposed over the 1st chemical protection layer; and
 - a 2nd chemical protection layer disposed over the 2nd passivation layer.
7. The system of claim 1, comprising:
 - an array of light detectors disposed in the image layer; and
 - an array of light guides disposed in the device stack, each light guide associated with at least one light detector of the array of light detectors.
8. The system of claim 7, wherein the passivation stack comprises a bottom surface in direct contact with a top surface of the light guides.
9. The system of claim 1, wherein the flow cell comprises:
 - a flow cell lid affixed to flow cell sidewalls, the flowcell sidewalls being bonded to the top layer of the passivation stack;
 - wherein the flowcell channel is formed by the flow cell lid, flow cell sidewalls and top layer of the passivation stack.
10. The system of claim 1, comprising:
 - a light shield layer disposed between the device stack and the passivation stack;
 - wherein, the bond pad extends through the light shield layer.
11. The system of claim 1, wherein a top surface of the bond pad is disposed below a bottom surface of the passivation stack.

12. A system comprising:
- an image sensor structure comprising:
 - an image layer disposed over a base substrate, the image layer comprising an array of light detectors disposed therein,
 - a device stack disposed over the image layer,
 - a plurality of bond pads disposed in the device stack,
 - an array of light guides disposed in the device stack,
 - a passivation stack disposed over the device stack and the plurality of bond pads,
 - an array of nanowells disposed in a top layer of the passivation stack, through-silicon via (TSV) in electrical contact with the bond pads of the plurality of bond pads, the TSV extending through the base substrate, and
 - a redistribution layer (RDL) disposed on a bottom surface of the base substrate, the RDL in electrical contact with the TSV; and
 - a flow cell disposed upon the top layer of the passivation stack to form a flow channel therebetween;
 - wherein the flow channel is disposed over the array of nanowells and extends over the plurality of bond pads;
 - wherein the passivation stack is disposed between the flow channel and the plurality of bond pads.
13. The system of claim 12, comprising:
- a 1st environmental protection layer disposed over a 1st portion of the RDL;
 - mechanical support structures disposed over the 1st environmental protection layer;
 - wires bonded in electrical contact to a 2nd portion of the RDL; and
 - a 2nd environmental protection layer disposed over the 2nd portion of the RDL;
- wherein the 1st and 2nd environmental protection layers cover the entire RDL.

14. The system of claim 12, wherein the passivation stack comprises:
a 1st passivation layer disposed over the device stack and the plurality of bond pads; and
a 1st chemical protection layer disposed over the 1st passivation layer.
15. The system of claim 14, wherein the passivation stack comprises:
a 2nd passivation layer disposed over the 1st chemical protection layer; and
a 2nd chemical protection layer disposed over the 2nd passivation layer.
16. The system of claim 1, wherein a top surface of the bond pad is in direct contact with a bottom surface of the passivation stack.
17. The system of claim 1, wherein an entire top surface of the bond pad is in direct contact with a bottom surface of the passivation stack.
18. The system of claim 12, wherein a top surface of each bond pad of the plurality of bond pads is in direct contact with a bottom surface of the passivation stack.
19. The system of claim 12, wherein an entire top surface of each bond pad of the plurality of bond pads is in direct contact with a bottom surface of the passivation stack.