

WHAT IS CLAIMED IS:

- 1 1. A method of forming a plurality of devices comprising:
2 forming a substrate by:
3 providing a polycrystalline ceramic core;
4 encapsulating the polycrystalline ceramic core with a first adhesion
5 shell;
6 encapsulating the first adhesion shell with a barrier layer;
7 forming a bonding layer on the barrier layer; and
8 forming a substantially single crystal layer coupled to the bonding
9 layer;
10 forming a buffer layer coupled to the substantially single crystal layer;
11 forming one or more epitaxial III-V layers on the buffer layer according to
12 requirements associated with the plurality of devices; and
13 forming the plurality of devices on the substrate by:
14 removing a portion of the one or more epitaxial III-V layers disposed
15 between the plurality of devices; and
16 removing a portion of the buffer layer disposed between the plurality
17 of devices.
- 1 2. The method of claim 1 wherein the one or more epitaxial III-V layers
2 comprise GaN.
- 1 3. The method of claim 1 further comprising planarizing the plurality of
2 devices on the substrate.
- 1 4. The method of claim 3 wherein planarizing further comprises:
2 forming a dielectric layer on the plurality of devices; and
3 smoothing the plurality of devices using chemical-mechanical planarization.
- 1 5. The method of claim 1 further comprising fabricating one or more
2 interconnects between a first device of the plurality of devices and a second device of the
3 plurality of devices.

- 1 6. The method of claim 1 further comprising:
2 bonding a first surface on each of the plurality of devices to a temporary
3 carrier, wherein the first surface is opposed to the substrate;
4 removing the substrate to expose a second surface on each of the devices;
5 forming a conducting layer on the second surface; and
6 bonding a carrier wafer to the conducting layer.
- 1 7. The method of claim 6 further comprising removing one or more
2 sections of the carrier wafer to form one or more backside contacts.
- 1 8. The method of claim 1 wherein the plurality of devices comprises a
2 depletion-mode high electron mobility transistor (HEMT), and an enhancement-mode
3 HEMT.
- 1 9. The method of claim 1 wherein the plurality of devices comprises a
2 first depletion-mode high electron mobility transistor (HEMT), and a second depletion-mode
3 HEMT.
- 1 10. The method of claim 1 wherein the plurality of devices comprises a
2 first enhancement-mode high electron mobility transistor (HEMT), and a second
3 enhancement-mode HEMT.
- 1 11. The method of claim 1 wherein the plurality of devices comprises a
2 high electron mobility transistor (HEMT) and a vertical device.
- 1 12. A method of forming a plurality of devices comprising:
2 forming a substrate by:
3 providing a polycrystalline ceramic core;
4 encapsulating the polycrystalline ceramic core with an adhesion shell;
5 encapsulating the adhesion shell with a barrier layer;
6 forming a bonding layer on the barrier layer; and
7 forming a substantially single crystal layer coupled to the bonding
8 layer;
9 forming a conducting layer coupled to the substantially single crystal layer;
10 forming a buffer layer coupled to the conducting layer;

11 forming one or more epitaxial III-V layers on the buffer layer according to
12 requirements for each of the plurality of devices; and
13 forming the plurality of devices by:
14 removing a portion of the one or more epitaxial III-V layers and a
15 portion of the buffer layer disposed between the plurality of devices to expose a portion of the
16 conducting layer;
17 forming a contact coupled to a portion of the exposed portion of the
18 conducting layer; and
19 removing a remaining exposed portion of the conducting layer not
20 coupled to the contact.

1 13. The method of claim 12 further comprising planarizing the plurality of
2 devices on the substrate.

1 14. The method of claim 13 wherein planarizing further comprises:
2 forming a dielectric layer on the plurality of devices; and
3 smoothing the plurality of devices using chemical-mechanical planarization.

1 15. The method of claim 12 further comprising fabricating one or more
2 interconnects between a first device of the plurality of devices and a second device of the
3 plurality of devices.

1 16. The method of claim 12 further comprising:
2 bonding a first surface on each of the plurality of devices to a temporary
3 carrier, wherein the first surface is opposed to the substrate;
4 removing the substrate to expose a second surface on each of the devices;
5 forming a second conducting layer on the second surface; and
6 bonding a carrier wafer to the second conducting layer.

1 17. The method of claim 16 further comprising removing one or more
2 sections of the carrier wafer to form one or more backside contacts.

1 18. The method of claim 12 wherein the plurality of devices comprises a
2 high electron mobility transistor (HEMT) and a vertical device.

1 19. The method of claim 18 wherein the HEMT comprises a depletion-
2 mode HEMT or an enhancement-mode HEMT.

1 20. The method of claim 18 wherein the vertical device comprises a
2 vertical P-N diode or a vertical Schottky diode.

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