

CLAIMS

What is claimed:

1. A method of cleaving substrate material, comprising:

- a. forming an initial crack in a bulk substrate material, wherein said initial crack is aligned along a ~~cleaving~~ plane of cleaving of said bulk substrate material, wherein said initial crack fully defines a plane, wherein a subsequent propagation of a crack converges along a desired path of said plane of cleaving;
- b. aligning said ~~cleaving~~ plane of cleaving between two parallel electrodes in a controlled environment, wherein said parallel electrodes comprise a top electrode and a bottom electrode, wherein said ~~cleaving~~ plane of cleaving is parallel with said two parallel electrodes, wherein a bottom portion of said bulk substrate material is physically and electrically connected to said bottom electrode; and
- c. applying a voltage across said two parallel electrodes, wherein said voltage is at least 50 kV, wherein said voltage establishes a uniform electromagnetic force on said top surface of said bulk substrate material, wherein said electromagnetic force is capable of inducing crack propagation along said ~~cleaving~~ plane of cleaving and separating a cleaved substrate material from said bulk substrate material.

2. The method according to claim 1, wherein forming said initial crack comprises using masked dry etching, masked plasma etching, masked vapor etching, masked wet etching, mechanical scribing, mechanical indentation, or laser ablation.

3. The method according to claim 1, wherein said controlled environment comprises a vacuum-compatible chamber, wherein said vacuum-compatible chamber comprises a dielectric gas.

5 4. The method according to claim 3, wherein said dielectric gas has a pressure in a range of 10^{-12} to 10 torr.

5. The method according to claim 3, wherein said dielectric gas comprises dry nitrogen, nitrous oxide or sulfur hexafluoride.

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6. The method according to claim 1, wherein said controlled environment comprises a pressure-compatible chamber, wherein said pressure-compatible chamber comprises a dielectric gas.

15 7. The method according to claim 5, wherein said dielectric gas has a pressure in a range of 1,000 to 80,000 torr.

8. The method according to claim 5, wherein said dielectric gas comprises dry nitrogen, nitrous oxide or sulfur hexafluoride.

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9. The method according to claim 1, wherein said controlled environment comprises a pressure-compatible chamber, wherein said pressure-compatible chamber comprises a dielectric liquid.

10. The method according to claim 9, wherein said dielectric liquid comprises
silicone oil, hexane, transformer oil, liquid nitrogen, or liquid oxygen.

11. The method according to claim 1, wherein said voltage comprises a switched
5 DC voltage, a set of voltage pulses or a switched AC voltage.

12. The method according to claim 1, wherein said bulk substrate material
comprises silicon, gallium arsenide, indium phosphide or germanium.

10 13. The method according to claim 1, wherein an insulating material is positioned
between said cleaved bulk substrate material and said top electrode, wherein
said insulating material protects said top electrode.

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