

CLAIMS:

1. A substrate support assembly comprising:
an electrostatic chuck body defining a substrate support surface;
a support stem coupled with the electrostatic chuck body;
5 an electrode embedded within the electrostatic chuck body proximate the
substrate support surface;
a ground electrode embedded within the electrostatic chuck body; and
one or more channels formed within the electrostatic chuck body between the
electrode and the ground electrode.
- 10 2. The substrate support assembly of claim 1, wherein the electrostatic chuck
body comprises a monolithic body of a ceramic material incorporating each of the electrode, the
ground electrode, and the one or more channels.
3. The substrate support assembly of claim 2, further comprising:
a heater embedded within the electrostatic chuck body between the electrode and
15 the ground electrode.
4. The substrate support assembly of claim 3, wherein the one or more
channels comprises a plurality of channels, wherein a first channel of the plurality of channels is
formed within the electrostatic chuck body between the electrode and the heater.
5. The substrate support assembly of claim 4, wherein a second channel of
20 the plurality of channels is formed within the electrostatic chuck body between the ground
electrode and the heater.
6. The substrate support assembly of claim 5, wherein a third channel of the
plurality of channels is formed within the electrostatic chuck body between the electrode and the
heater vertically offset within the electrostatic chuck body from the first channel of the plurality
25 of channels.
7. The substrate support assembly of claim 6, wherein the first channel
comprises a set of first interconnected channels comprising:

a plurality of first annular channels distributed across a first plane of the electrostatic chuck body, and

a plurality of first channel interconnects distributed radially between each first annular channel of the plurality of first annular channels.

5 8. The substrate support assembly of claim 7, wherein the third channel comprises a set of second interconnected channels comprising:

a plurality of second annular channels distributed across a second plane of the electrostatic chuck body, wherein the second plane of the electrostatic chuck body is vertically offset from the first plane of the electrostatic chuck body, and

10 a plurality of second channel interconnects distributed radially between each second annular channel of the plurality of second annular channels.

 9. The substrate support assembly of claim 8, wherein the plurality of second annular channels are radially offset from the plurality of first annular channels, and wherein the plurality of second channel interconnects are azimuthally offset from the plurality of first
15 channel interconnects.

 10. The substrate support assembly of claim 8, the second channel comprises a set of third interconnected channels comprising:

 a plurality of third annular channels distributed across a third plane of the electrostatic chuck body, wherein the third plane of the electrostatic chuck body is vertically
20 offset from the first plane of the electrostatic chuck body and the second plane of the electrostatic chuck body, and

 a plurality of third channel interconnects distributed radially between each third annular channel of the plurality of third annular channels.

 11. The substrate support assembly of claim 10, wherein each channel of the
25 plurality of third annular channels is vertically aligned with an associated channel of the plurality of first annular channels, and wherein the plurality of second channel interconnects are azimuthally aligned with the plurality of first channel interconnects.

 12. The substrate support assembly of claim 10, further comprising:

a fourth channel formed within the third plane of the electrostatic chuck body, and configured to seat a thermocouple extended through the support stem coupled with the electrostatic chuck body.

13. A substrate support assembly comprising:
- 5 an electrostatic chuck body defining a substrate support surface;
a support stem coupled with the electrostatic chuck body;
an electrode embedded within the electrostatic chuck body proximate the substrate support surface;
a ground electrode embedded within the electrostatic chuck body;
10 a first set of interconnected channels formed within the electrostatic chuck body between the electrode and the ground electrode; and
a second set of interconnected channels formed within the electrostatic chuck body between the electrode and the ground electrode.

14. The substrate support assembly of claim 13, wherein the second set of
15 interconnected channels are radially offset from the first set of interconnected channels.

15. The substrate support assembly of claim 13, wherein the first set of interconnected channels are maintained at least 5 mm from a radial edge of the electrostatic chuck body.

16. The substrate support assembly of claim 13, wherein the first set of
20 interconnected channels and the second set of interconnected channels are maintained at atmospheric pressure.

17. The substrate support assembly of claim 16, wherein an effective capacitance within the electrostatic chuck body between the electrode and the ground electrode is less than or about 1,000 pF.

18. The substrate support assembly of claim 13, wherein the electrostatic
25 chuck body is characterized by a volume percentage of air greater than or about 10%.

19. The substrate support assembly of claim 13, further comprising:

a heater positioned between the electrode and the ground electrode, and
a third set of interconnected channels formed within the electrostatic chuck body
between the heater and the ground electrode.

20. A substrate support assembly comprising:
- 5 an electrostatic chuck body defining a substrate support surface;
a support stem coupled with the electrostatic chuck body;
an electrode embedded within the electrostatic chuck body proximate the
substrate support surface;
a ground electrode embedded within the electrostatic chuck body;
10 a heater embedded within the electrostatic chuck body between the electrode and
the ground electrode;
a first set of interconnected channels formed within the electrostatic chuck body
between the electrode and the heater;
a second set of interconnected channels formed within the electrostatic chuck
15 body between the first set of interconnected channels and the heater; and
a third set of interconnected channels formed within the electrostatic chuck body
between the heater and the ground electrode.