CLAIMS

1. An adhesive for bonding components of a substrate support, comprising:

a matrix of silicon-based polymeric material having a filler dispersed therein, wherein the silicon based polymeric material comprises a polydimethylsiloxane (PDMS) structure having a molecular weight with a low molecular weight (LMW) content Σ D3 – D10 of less than about 500 ppm.

2. The adhesive of claim 1, wherein the adhesive has a metal content of less than about 1 percent.

3. The adhesive of any of claims 1-2, wherein the adhesive is substantially non-reactive with halogen containing chemistries.

4. The adhesive of any of claims 1-3, wherein the adhesive is operable at a temperature of between about 120 degrees Celsius and about 180 degrees Celsius.

5. The adhesive of any of claims 1-4, wherein the adhesive has a thermal conductivity of at least about 0.5 W/mK.

6. The adhesive of any of claims 1-5, wherein the filler comprises between about 50 to about 70 percent by volume of the adhesive layer.

7. The adhesive of any of claims 1-6, wherein the filler comprises particles of aluminum oxide (Al_2O_3), aluminum nitride (AlN), yttrium oxide (Y_2O_3), or combinations thereof.

8. The adhesive of any of claims 1-7, wherein the filler comprises particles having a diameter of about 10 nanometers to about 10 microns.

9. A substrate support, comprising:

a base;

an adhesive layer comprising an adhesive as described in any of the preceding claims; and

an electrostatic chuck disposed atop the base and the adhesive layer, wherein the adhesive layer bonds the base and the electrostatic chuck.

10. The substrate support of claim 9, wherein the base comprises one of aluminum, stainless steel, ceramic, or aluminum-ceramic composite.

11. The substrate support of any of claims 9-10, further comprising:

a baffle assembly disposed proximate the base, wherein the baffle assembly is configured to hold one of a process kit or a process shield.

12. The substrate support of any of claims 9-11, wherein the adhesive layer is about 0.004 to about 0.015 inches thick.

13. A method of bonding a substrate support to an electrostatic chuck, comprising:

depositing an adhesive layer comprising an adhesive as described in any of claims 1-8 atop a substrate support base; and

bonding an electrostatic chuck to the substrate support base with the adhesive layer.

14. The method of claim 13, wherein bonding the electrostatic chuck to the substrate support base comprises:

applying a pressure of about 0.5 to about 14.5 psi between the electrostatic chuck and the base while heating at least one of the base or adhesive layer to a predetermined temperature; or

placing the electrostatic chuck, adhesive layer, and substrate support base in a pressure vessel at a pressure of about 50 to about 200 psi while the adhesive cures.

15. The method of any of claims 13-14, further comprising at least one of:

heating at least one of the base or the electrostatic chuck to a temperature of about 50 to about 110 degrees Celsius prior to depositing the adhesive layer; or

heating the electrostatic chuck, adhesive layer and base, after bonding, to a temperature of between about 10 to 30 degrees Celsius above a bonding temperature to at least partially remove lower molecular weight residues from the adhesive layer.

CLAIMS

1. An adhesive for bonding components of a substrate support, comprising:

a matrix of silicon-based polymeric material having a filler dispersed therein, wherein the silicon based polymeric material comprises a polydimethylsiloxane (PDMS) structure having three to ten repeating units of dimethylsiloxane, wherein the sum of all constituents of the three to ten repeating units of dimethylsiloxane is less than 500 ppm, wherein the adhesive is substantially non-reactive with halogen containing chemistries, and wherein the filler comprises between 67 to 70 percent by volume of the adhesive layer.

2. The adhesive of claim 1, wherein the adhesive is operable at a temperature of between 120℃ and 180℃.

3. The adhesive of claim 1, wherein the adhesive has a thermal conductivity of at least 0.5 W/mK.

4. The adhesive of claim 1, wherein the filler comprises particles of aluminum oxide (Al_2O_3), aluminum nitride (AlN), yttrium oxide (Y_2O_3), or combinations thereof.

5. The adhesive of claim 1, wherein the filler comprises particles having a diameter of 10 nanometers to 10 microns.

6. A substrate support, comprising:

a base;

an adhesive layer comprising an adhesive as described in any of claims 1 to 5; and

an electrostatic chuck disposed atop the base and the adhesive layer, wherein the adhesive layer bonds the base and the electrostatic chuck.

7. The substrate support of claim 6, wherein the base comprises one of aluminum, stainless steel, ceramic, or aluminum-ceramic composite.

8. The substrate support of claim 6, wherein the adhesive layer is 0.1 to 0.38 mm thick.

9. A method of bonding a substrate support to an electrostatic chuck, comprising:

depositing an adhesive layer comprising an adhesive as described in any of claims 1 to 5 atop a substrate support base; and

bonding an electrostatic chuck to the substrate support base with the adhesive layer.

10. The method of claim 9, wherein bonding the electrostatic chuck to the substrate support base comprises:

applying a pressure of 3,447 to 99,973 Pa between the electrostatic chuck and the base while heating at least one of the base or adhesive layer to a predetermined temperature; or

placing the electrostatic chuck, adhesive layer, and substrate support base in a pressure vessel at a pressure of 344,737 to 1,378,951 Pa while the adhesive cures.

11. The method of claim 9, further comprising at least one of:

heating at least one of the base or the electrostatic chuck to a temperature of 50℃ to 110℃ prior to depositing the adhesive layer; or

heating the electrostatic chuck, adhesive layer and base, after bonding, to a temperature of between 10℃ to 30℃ above a bonding temperature to at least partially remove lower molecular weight residues from the adhesive layer.