Claims:

1. A substrate processing method, comprising:

sequentially stacking a plurality of dies on a substrate into a stacked assembly;

thermally treating the plurality of dies; and

stacking at least one additional die atop the thermally treated plurality of dies,

wherein thermally treating and stacking are performed in separate processing chambers of an integrated bonder system, which includes a mainframe comprising a substrate handling system and the processing chambers connected to the mainframe.

2. The method of claim 1, further comprising annealing the stacked assembly and the at least one additional die after stacking the at least one additional die, wherein thermally treating is performed at at least one of a lower temperature or a shorter duration than the annealing.

3. The method of claim 1, wherein thermally treating is performed after stacking a certain number of dies of the plurality of dies on the substrate.

4. The method of claim 3, wherein the certain number is less than or equal to half of the plurality of dies.

6. The method of claim 1, wherein thermally treating includes contacting at least one of the plurality of dies using a thermally conductive structure.

7. The method of claim 1, wherein thermally treating includes applying a pressure on at least one die of the plurality of dies.

8. The method of claim 7, wherein the pressure is about 10 to about 100 MPa.

9. The method of claim 1, further comprising cleaning and activating a backside of each die.

10. The method of claim 9, wherein activating includes plasma treatment or wet chemistry activation.

11. The method of claim 1, wherein thermally treating is performed in one or more of a vacuum, and/or thermally treating is performed at a pressure of 3 mTorr to 760 Torr, and/or thermally treating is performed in an inert gas environment or a reducing environment, and/or thermally treating is performed at a substrate temperature of 100°C to 400°C, and/or thermally treating is performed for 0.5 minutes to 1 hour. .

12. The method of claim 1, wherein thermally treating includes ramping temperature up to 100°C per second.

13. An integrated bonder system for processing a substrate, comprising:

a mainframe comprising a substrate handling system;

a thermal treatment chamber connected to the mainframe, the thermal treatment chamber configured to perform rapid thermal processing on a substrate and a plurality of dies sequentially stacked on the substrate;

a bonding chamber connected to the mainframe;

a plasma chamber connected to the mainframe;

a wet clean chamber connected to the mainframe; and

a UV chamber connected to the mainframe.

14. The system of claim 13, further comprising a controller including a processor and a memory configured to:

control the bonding chamber to sequentially stack a plurality of dies on a substrate into a stacked assembly;

control the thermal treatment chamber to thermally treat the plurality of dies; and

control the bonding chamber to stack at least one additional die atop the thermally treated plurality of dies.

15. The system of claim 14, wherein the controller is configured to control the wet clean chamber to clean a backside of each die after stacking, and control the plasma chamber to activate a backside of each die after stacking.