

WHAT IS CLAIMED IS:

1. A method of processing a single crystal silicon ingot, the method comprising:

grinding the single crystal silicon ingot, wherein the single crystal silicon ingot comprises a seed end, a tail end opposite the seed end, and a main body between the seed end and the tail end, wherein the main body is ground to a constant diameter;

annealing the ground single crystal silicon ingot for a temperature and duration sufficient to reduce the size or number of localized laser scattering defects on a wafer sliced from the single crystal silicon ingot; and

slicing the annealed single crystal silicon ingot into at least two single crystal silicon wafers.

2. The method of claim 1 wherein the single crystal silicon ingot is grown by the Czochralski process, and the single crystal silicon ingot is cooled before grinding.

3. The method of claim 1 wherein the diameter of the main body of the single crystal silicon ingot is at least about 150 mm, at least about 200 mm, at least about 300 mm, or at least about 450 mm.

4. The method of claim 1 further comprising the step of cropping the single crystal silicon ingot into one or more segments, wherein the thickness of a segment is at least about 1 cm, at least about 10 cm, or at least about 20 cm.

5. The method of claim 1 further comprising the step of cropping the single crystal silicon ingot into one or more segments, wherein the thickness of a segment is less than about 1 m, less than about 50 cm, or less than about 40 cm, or less than about 30 cm.

6. The method of claim 1 further comprising the step of cropping the single crystal silicon ingot into one or more segments, wherein the thickness of a segment is between about 10 cm and about 30 cm.

7. The method of claim 1 wherein each single crystal silicon wafer sliced from the annealed ingot comprises two major, generally parallel surfaces, one of which is a front surface of the single crystal silicon wafer and the other of which is a back surface of the single crystal silicon wafer, a circumferential edge joining the front and back surfaces of the single crystal silicon wafer, a central plane between and parallel to the front surface and the back surface of the single crystal silicon wafer, a central axis perpendicular to the central plane, and a bulk region between the front and back surfaces of the single crystal silicon wafer, wherein each wafer has a thickness as measured between the front and back surfaces of the single crystal silicon wafer and along the central axis is less than about 1500 micrometers.

8. The method of claim 1 wherein the annealed single crystal silicon ingot is sliced into at between about two single crystal silicon wafers and about 300 single crystal silicon wafers.

9. The method of claim 1 wherein the annealed single crystal silicon ingot is sliced into about 300 single crystal silicon wafers.

10. The method of claim 1 wherein the single crystal silicon ingot is annealed in an ambient atmosphere comprising argon, nitrogen, or a combination of argon and nitrogen.

11. The method of claim 1 wherein the single crystal silicon ingot is annealed in an ambient atmosphere comprising nitrogen.

12. The method of claim 1 wherein the single crystal silicon ingot is annealed in an ambient atmosphere consisting essentially of nitrogen.

13. The method of claim 1 wherein the single crystal silicon ingot is annealed at a temperature of at least about 600°C.

14. The method of claim 1 wherein the single crystal silicon ingot is annealed at a temperature between about 600°C and about 1000°C.

15. The method of claim 1 wherein the single crystal silicon ingot is annealed at a temperature between about 600°C and about 900°C.

16. The method of claim 1 wherein the single crystal silicon ingot is annealed for a duration of at least about 1 hour.

17. The method of claim 1 wherein the single crystal silicon ingot is annealed for a duration between about 1 hour and about 4 hours.

18. The method of claim 1 wherein the single crystal silicon ingot is annealed for a duration of about 2 hours.

19. A method of processing a single crystal silicon ingot, the method comprising:

removing a seed cone and a tail cone from the single crystal silicon ingot, wherein the single crystal silicon ingot comprises the seed cone, the tail cone opposite the seed cone, and a main body between the seed cone and the tail cone;

cropping the main body of the single crystal silicon ingot so that the main body of the single crystal silicon ingot comprises one or more single crystal silicon segments, wherein the thickness of a segment is at least about 1 cm, at least about 10 cm, or at least about 20 cm;

annealing one or more of the cropped single crystal silicon segments for a temperature and duration sufficient to reduce the size or number of localized laser scattering defects on a wafer sliced from the single crystal silicon segment; and

slicing the annealed single crystal silicon segment into at least two single crystal silicon wafers.

20. The method of claim 19 wherein the single crystal silicon ingot is grown by the Czochralski process.

21. The method of claim 19 further comprising grinding the main body of the single crystal silicon segment, wherein the main body is ground to a constant diameter of

at least about 150 mm, at least about 200 mm, at least about 300 mm, or at least about 450 mm.

22. The method of claim 19 wherein the thickness of a single crystal silicon segment is less than about 1 m, less than about 50 cm, or less than about 40 cm, or less than about 30 cm.

23. The method of claim 19 wherein the thickness of a single crystal silicon segment is between about 10 cm and about 30 cm.

24. The method of claim 19 wherein each single crystal silicon wafer sliced from the annealed single crystal silicon segment comprises two major, generally parallel surfaces, one of which is a front surface of the single crystal silicon wafer and the other of which is a back surface of the single crystal silicon wafer, a circumferential edge joining the front and back surfaces of the single crystal silicon wafer, a central plane between and parallel to the front surface and the back surface of the single crystal silicon wafer, a central axis perpendicular to the central plane, and a bulk region between the front and back surfaces of the single crystal silicon wafer, wherein each wafer has a thickness as measured between the front and back surfaces of the single crystal silicon wafer and along the central axis is less than about 1500 micrometers.

25. The method of claim 19 wherein the annealed single crystal silicon segment is sliced into at between about two single crystal silicon wafers and about 300 single crystal silicon wafers.

26. The method of claim 19 wherein the annealed single crystal silicon segment is sliced into about 300 single crystal silicon wafers.

27. The method of claim 19 wherein the single crystal silicon segment is annealed in an ambient atmosphere comprising argon, nitrogen, or a combination of argon and nitrogen.

28. The method of claim 19 wherein the single crystal silicon segment is annealed in an ambient atmosphere comprising nitrogen.

29. The method of claim 19 wherein the single crystal silicon segment is annealed in an ambient atmosphere consisting essentially of nitrogen.

30. The method of claim 19 wherein the single crystal silicon segment is annealed at a temperature of at least about 600°C.

31. The method of claim 19 wherein the single crystal silicon segment is annealed at a temperature between about 600°C and about 1000°C.

32. The method of claim 19 wherein the single crystal silicon segment is annealed is annealed at a temperature between about 600°C and about 900°C.

33. The method of claim 19 wherein the single crystal silicon segment is annealed for a duration of at least about 1 hour.

34. The method of claim 19 wherein the single crystal silicon segment is annealed for a duration between about 1 hour and about 4 hours.

35. The method of claim 19 wherein the single crystal silicon segment is annealed for a duration of about 2 hours.