SUMMARY OF THE INVENTION

A laser cutting method and a substrate holder (vacuum chuck fixture) for silicon wafers is disclosed. The cutting method by laser cleavage introduces an external bending force during cutting to enhance the laser-induced thermal cracking process for laser cleavage of brittle substrates such as silicon wafers.

According to one aspect of the invention, there is provided a wafer dicing apparatus. The wafer dicing apparatus includes a grille, a vacuum suction unit and a cutter. The grille includes an alternating rib and slot arrangement for supporting a wafer, wherein one slot is between two adjacent ribs. The vacuum suction unit is in fluid communication with the grille and sucks air through at least one slot of the grille. The cutter dices the wafer, where either the grille, the cutter or both is configured to align the wafer to be diced along the rib of the grille.

~~According to another aspect of the invention~~As disclosed, there is provided a wafer dicing method. The method includes providing a wafer, stressing the wafer along a length that extends between two opposite points of the wafer perimeter, and dicing the wafer along the length where the wafer is stressed.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1, comprising Figures 1A to 1D, shows various defects resulting from conventional laser cutting of brittle substrates such as processed silicon wafers.

Figure 2, comprising Figures 2A to 2D, shows perspective views of a vacuum chuck for laser cleavage in accordance with the present embodiment. Figure 2A is a perspective view of an unassembled apparatus for cleavage including a porous chuck as a vacuum chuck and Figure 2B is a perspective view of the assembled apparatus. Figures 2C and 2D show the porous chuck, steel plate having a grille and wafer arrangement for laser cleavage.

14. A wafer dicing apparatus according to any one of the preceding claims, wherein either the grille, the cutter or both is further configured to:

align the wafer to be diced in a direction that is misaligned with respect to the rib of the grille to produce a cut in a first orientation; and

to rotate the wafer to align the wafer to be diced along the rib of the grille to produce a cut in a second orientation.

15. A wafer dicing apparatus according to claim 14, wherein the rotation angle between the first orientation and the second orientation is up to 90^{o}.

16. A wafer dicing apparatus according to any one of the preceding claims, wherein the cutter comprises any one or more of the following devices: saw or laser.

~~17. A wafer dicing method comprising,~~

~~providing a wafer;~~

~~stressing the wafer along a length that extends between two opposite points of the wafer perimeter; and~~

~~dicing the wafer along the length where the wafer is stressed.~~

~~18. A wafer dicing method according to claim 17, wherein the method further comprises, prior to stressing the wafer along the length that extends between the two opposite points of the wafer perimeter,~~

~~dicing the wafer along a length that extends between two different opposite points of the wafer perimeter to produce a cut in a first orientation; and~~

~~rotating the wafer, wherein dicing of the wafer along the length where the wafer is stressed produces a cut in a second orientation that is misaligned to the cut of the first orientation.~~

19. A wafer dicing method according to claim 17 or 18, wherein the stressing of the wafer is achieved by:

providing the wafer across an alternating rib and slot arrangement of a grille, the alternating rib and slot arrangement comprising one slot between two adjacent ribs; and

sucking air through at least one slot of the grille to stress the wafer along the rib of the grille.