

useful layer transferred according to the method disclosed above. In the illustrated example, the patterns comprise side and circular patterns (respectively indicated by a and b in this Figure). Such patterns have been made apparent by measuring the "haze", as per the current English terminology, corresponding to the intensity of light broadcast by the layer surface, using the inspection tool Surfscan™ by the KLA-Tencor company. Reference can be made to the article « Seeing through the haze », by F. Holsteyns, Yield Management Solution, Spring 2004, pp50-54 for further information on such inspection technique.

To solve this problem, the above document provides to equip the assembly to be fractured with an absorbing element for detecting and dissipating the emitted acoustic wave, and preventing or limiting the formation of such patterns of variation in the thickness of the useful layer. Although this method is perfectly efficient, it nevertheless requires the implementation of one absorbing element on at least one of the faces of the assembly to be fractured, which makes the method for transferring the useful layer more complex.

OBJECT OF THE INVENTION

Embodiments of the invention seek to provide a simple method for transferring a useful layer, with such useful layer having a pattern of variation in the thickness with a reduced extent.

BRIEF DESCRIPTION OF THE INVENTION

An aspect of the present disclosure provides a method for transferring a useful layer onto a support comprising the following steps:

forming an embrittlement plane by implanting light elemental species into a first substrate, so as to define a

useful layer between the embrittlement plane and one surface of the first substrate;

applying the support onto the surface of the first substrate so as to form an assembly to be fractured;

5 applying a heat treatment for embrittling the assembly to be fractured; and

initiating and propagating a fracture wave in the first substrate along the embrittlement plane;

wherein:

10 the fracture wave is initiated in a central area of the embrittlement plane;

the propagation speed of the fracture wave is controlled so that the velocity thereof is sufficient to cause interactions of the fracture wave with acoustic vibrations emitted upon the initiation and/or propagation thereof, if any, are confined to a peripheral area of the useful layer; and

the propagation speed of the fracture wave is controlled so as to have a velocity higher than one third of the speed of the acoustic wave.

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Another aspect of the present disclosure provides a method for transferring a useful layer onto a support comprising the following steps:

25 forming an embrittlement plane by implanting light elemental species into a first substrate, so as to define a useful layer between the embrittlement plane and one surface of the first substrate;

applying the support onto the surface of the first substrate so as to form an assembly to be fractured;

30 applying a heat treatment for embrittling the assembly to be fractured; and

initiating and propagating a fracture wave in the first substrate along the embrittlement plane;

wherein:

35 the fracture wave is initiated in a central area of the embrittlement plane; the propagation speed of the fracture wave is controlled so that the velocity thereof is sufficient to cause interactions of the fracture wave with acoustic

vibrations emitted upon the initiation and/or propagation thereof, if any, are confined to a peripheral area of the useful layer;

the fracture wave is initiated by energy input at the central area of the embrittlement plane; and the propagation speed is controlled by causing the embrittlement plane to have a maturing rate at least equal to a target maturing rate during the embrittlement heat treatment.

Another aspect of the present disclosure provides a method for transferring a useful layer onto a support comprising the following steps:

forming an embrittlement plane by implanting light elemental species into a first substrate, so as to define a useful layer between the embrittlement plane and one surface of the first substrate;

applying the support onto the surface of the first substrate so as to form an assembly to be fractured;

applying a heat treatment for embrittling the assembly to be fractured; and

initiating and propagating a fracture wave in the first substrate along the embrittlement plane;

wherein:

the fracture wave is initiated in a central area of the embrittlement plane;

the propagation speed of the fracture wave is controlled so that the velocity thereof is sufficient to cause interactions of the fracture wave with acoustic vibrations emitted upon the initiation and/or propagation thereof, if any, are confined to a peripheral area of the useful layer; and

the peripheral area comprises an annular area, an inner radius of the annular area being greater than $2/3$ of the radius of the first substrate.

There is also disclosed a method for transferring a useful layer onto a support comprising the following steps of:

- forming an embrittlement plane by implanting light species into a first substrate, so as to form a useful

CLAIMS

1. A method for transferring a useful layer onto a support comprising the following steps:

5 forming an embrittlement plane by implanting light elemental species into a first substrate, so as to define a useful layer between the embrittlement plane and one surface of the first substrate;

10 applying the support onto the surface of the first substrate so as to form an assembly to be fractured;

applying a heat treatment for embrittling the assembly to be fractured; and

initiating and propagating a fracture wave in the first substrate along the embrittlement plane;

15 wherein:

the fracture wave is initiated in a central area of the embrittlement plane;

20 the propagation speed of the fracture wave is controlled so that the velocity thereof is sufficient to cause interactions of the fracture wave with acoustic vibrations emitted upon the initiation and/or propagation thereof, if any, are confined to a peripheral area of the useful layer; and

25 the propagation speed of the fracture wave is controlled so as to have a velocity higher than one third of the speed of the acoustic wave.

2. The method of claim 1, wherein the first substrate comprises silicon, and wherein the propagation of the fracture wave is controlled so as to have a velocity above 2 km/sec.

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3. The method of claim 2, wherein the propagation of the fracture wave is controlled so as to have a velocity ranging from 2 km/second to 4.5 km/second.

35 4. The method of claim 3, wherein the propagation of the fracture wave is controlled so as to have a velocity ranging from 3.8 km/second to 4.2 km/second.

5. The method of claim 1, wherein the temperature of the embrittlement heat treatment is above 400°C.

6. The method of claim 5, wherein the temperature of the embrittlement heat treatment is above 500°C.

7. The method of claim 1, wherein the initiation of the fracture wave is caused by an incipient fracture positioned in the central area of the embrittlement plane.

8. The method of claim 7, wherein the incipient fracture comprises a volume containing a higher concentration of light elemental species compared to the average concentration in the embrittlement plane.

9. The method of claim 1, wherein the fracture wave is initiated by energy input at the central area of the embrittlement plane.

10. The method of claim 9, wherein the propagation speed is controlled by causing the embrittlement plane to have a maturing rate at least equal to a target maturing rate during the embrittlement heat treatment.

11. The method of claim 1, wherein the peripheral area comprises an annular area, an inner radius of the annular area being greater than 2/3 of the radius of the first substrate.

12. The method of claim 11, wherein the peripheral area is totally encompassed in one exclusion area of the useful layer.

13. The method of claim 11, wherein the inner radius of the annular area is greater than 80% of the radius of the first substrate.

14. The method of claim 1, wherein the fracture wave is initiated by applying the embrittlement heat treatment and

wherein the propagation speed is controlled by selecting the temperature of the embrittlement heat treatment at the time of the initiation.

5 15. The method of claim 7, wherein the incipient fracture comprises a cavity or a body positioned at the interface between the first substrate and the support in line with the central area of the embrittlement plane.

10 16. The method of claim 1, wherein the first substrate comprises a disk-shaped board, and wherein the central area comprises the geometric center of the board.

15 17. A method for transferring a useful layer onto a support comprising the following steps:

 forming an embrittlement plane by implanting light elemental species into a first substrate, so as to define a useful layer between the embrittlement plane and one surface of the first substrate;

20 applying the support onto the surface of the first substrate so as to form an assembly to be fractured;

 applying a heat treatment for embrittling the assembly to be fractured; and

25 initiating and propagating a fracture wave in the first substrate along the embrittlement plane;

 wherein:

30 the fracture wave is initiated in a central area of the embrittlement plane; the propagation speed of the fracture wave is controlled so that the velocity thereof is sufficient to cause interactions of the fracture wave with acoustic vibrations emitted upon the initiation and/or propagation thereof, if any, are confined to a peripheral area of the useful layer;

35 the fracture wave is initiated by energy input at the central area of the embrittlement plane; and

 the propagation speed is controlled by causing the embrittlement plane to have a maturing rate at least equal to

a target maturing rate during the embrittlement heat treatment.

18. A method for transferring a useful layer onto a
5 support comprising the following steps:

forming an embrittlement plane by implanting light
elemental species into a first substrate, so as to define a
useful layer between the embrittlement plane and one surface
of the first substrate;

10 applying the support onto the surface of the first
substrate so as to form an assembly to be fractured;

applying a heat treatment for embrittling the assembly to
be fractured; and

15 initiating and propagating a fracture wave in the first
substrate along the embrittlement plane;

wherein:

the fracture wave is initiated in a central area of the
embrittlement plane;

20 the propagation speed of the fracture wave is controlled so
that the velocity thereof is sufficient to cause interactions
of the fracture wave with acoustic vibrations emitted upon the
initiation and/or propagation thereof, if any, are confined to
a peripheral area of the useful layer; and

25 the peripheral area comprises an annular area, an inner
radius of the annular area being greater than $2/3$ of the
radius of the first substrate.