CLAIMS:

1. A method for separating bonded wafer structures, the method comprising:

cleaving a bonded wafer structure, wherein cleaving a bonded wafer structure comprises separating a first structure from a second structure by a mechanical cleave process in which separation occurs by propagation from a leading edge of the bonded wafer structure toward a trailing edge opposite from the leading edge;

sensing sound emitted from the bonded wafer structure while separating the first structure from the second structure by the mechanical cleave process; and

generating a metric related to an attribute of the cleave based on sound sensed while separating the first structure from the second structure by the mechanical cleave process.

2. The method as set forth in claim 1 comprising adjusting a cleave control parameter to improve the quality of the cleave of subsequently cleaved bonded wafer structures.

3. The method as set forth in claim 1 wherein the metric is derived from an audio power profile generated during the cleave.

4. The method as set forth in claim 3 wherein the metric is selected from the group consisting of delay between a cleave trigger and a start of cleave, duration of the cleave, mean power, maximum power, frequency at which maximum power occurs, standard deviation of power, magnitude of power oscillations, amount of cleave time below a threshold power, maximum single dip time below a

threshold power and the number of power dips below a threshold power.

5. The method as set forth in claim 1 comprising detecting when a cleave sequence has commenced for cleaving the bonded wafer structure, wherein sound is sensed upon detecting that the cleave sequence has commenced.

6. The method as set forth in claim 1 comprising converting sensed sound into data, the metric related to an attribute of the cleave being based on the data.

7. The method as set forth in claim 1 wherein generating a metric related to an attribute of the cleave based on sensed sound comprises generating a power function by a fast Fourier transform algorithm.

8. The method as set forth in claim 7 wherein the algorithm is a stepped fast Fourier transform algorithm.

9. The method as set forth in claim 1 wherein the generating a metric related to an attribute of the cleave based on sensed sound comprises generating a power function by digital filtering.

10. The method as set forth in claim 1 wherein the mechanical cleave process comprises a blade or mechanical wedge at the leading edge of the bonded wafer structure to propagate the cleave.

11. A cleave system for separating a bonded wafer structure, the system comprising:

a cleaving device for cleaving the bonded wafer structure along a cleave plane, the cleaving device comprising one or more suction cups for applying a mechanical force to the bonded wafer structure to cleave the bonded wafer structure;

an acoustic sensor for sensing sound emitted from the bonded wafer structure during cleaving and to generate an output in response to the sensed sound; and

a controller configured to generate a metric related to an attribute of the cleave based at least in part on the output of the acoustic sensor.

12. The cleave system as set forth in claim 11 wherein the metric is derived from an audio power profile generated during the cleave.

13. The cleave system as set forth in claim 11 wherein the cleaving device is a mechanical cleaving device, configured to produce a propagated cleave of the bonded wafer structure.

14. The cleave system as set forth in claim 11 wherein the cleaving device is a thermal cleaving device.

15. The cleave system as set forth in claim 11 further comprising a trigger sensor for detecting when a cleave sequence has commenced for cleaving the bonded wafer structure.

16. The cleave system as set forth in claim 11 further comprising an analog-to-digital converter for converting sound sensed by the acoustic sensor into data, the metric related to an attribute of the cleave generated by the controller being based at least in part on the data generated by the analog to digital converter.

17. The cleave system as set forth in claim 16 wherein the analog-to-digital converter comprises a digitizer or a sound card.

18. The cleave system as set forth in claim 11 wherein the controller is configured to generate 2 or more metrics related to attributes of the cleave based at least in part on the output of the acoustic sensor.

19. The cleave system as set forth in claim 11 wherein the cleaving device comprises a blade or mechanical wedge to propagate the cleave at an edge of the bonded wafer structure.