8. The apparatus in accordance with claim 1, adapted to be used as dopant profiler, further comprising magnetic or piezoelectric actuator means for controlling the distance between the cantilever and a surface of the sample, force detection means for measuring the deflection of the cantilever, and switchable feedback means for controlling said actuator means, said feedback means being switchable to said force detection means or to the output of the amplifying means.

9. The apparatus in accordance with claim 1, adapted to be used as dopant profiler, further comprising magnetic or piezoelectric actuator means for controlling the distance between the cantilever and the surface of the sample, means for detecting a tunnel current between a tip of the cantilever and the sample, force detection means for measuring the deflection of the cantilever, and switchable feedback means for controlling said actuator means, said feedback means being switchable to said tunnel current, to said force detection means, or to the output of the amplifying means.

10. The apparatus in accordance with claim 1, including means for positioning a sample, means for processing measured force or deflection signals to generate a screen display, and means for permanently storing the processed force or deflection signals on a magnetic medium.

11. The apparatus of claim 1 including means for providing a dopant profile of a semiconductor device based on the harmonic frequency nw.

12. A method for measuring a force exerted upon or a deflection of a flexible cantilever used in atomic force microscopy, comprising steps of: generating a single high frequency radiation signal w from a single source in a gap between said cantilever and a second surface during the performance of atomic force microscopy on a sample, receiving and amplifying a higher harmonic nw of the single high frequency signal of said radiation signal w and determining physical characteristics of the sample using the higher harmonic.

13. The method in accordance with claim 12, wherein oscillations of the flexible cantilever are excited by an externally applied force.

14. The method in accordance with claim 13, wherein oscillations of the flexible cantilever are excited by an externally applied electrical signal.

15. The method of claim 14 where said sample is a semiconductor item and n is equal to two to distinguish areas with high dopant concentrations from areas with low dopant concentration.

16. The method in accordance with claim 12, applied for investigating surface and/or volume properties of a sample.

17. The method of claim 12 using the harmonic signal nw to define surface characteristics to the sample.

18. An apparatus for measuring a force exerted upon or a deflection of a flexible cantilever used in atomic force microscopy, comprising antenna means for receiving radiation produced during atomic force microscopy of a sample using said cantilever, amplifying means for detecting the antenna output and generating a signal therefrom, a cavity with conductive walls enclosing the cantilever, with one of said walls being moveable relative to the others, and means to apply in operation a DC voltage to said cantilever.

19. An apparatus for use as a dopant profiler by measuring a force exerted upon or a deflection of a flexible cantilever used in atomic force microscopy, comprising the antenna means for receiving radiation produced during atomic force microscopy of a sample using said cantilever, amplifying means for detecting the antenna output and generating a signal therefrom, magnetic or piezoelectric actuator means for controlling the distance between the cantilever and a surface of the sample, force detection means for measuring the deflection of the cantilever, switchable feedback means for controlling said actuator means, said feedback means being switchable to said force detection means or to the output of the amplifying means, and means to apply in operation a DC voltage to said cantilever.

20. An apparatus for use as a dopant profiler by measuring a force exerted upon or a deflection of a flexible cantilever used in atomic force microscopy, comprising antenna means for receiving radiation produced during atomic force microscopy of a sample using said cantilever, amplifying means for detecting the antenna output and generating a signal therefrom, a magnetic or piezoelectric actuator means for controlling the distance between the cantilever and a surface of the sample, means for detecting a tunnel current between a tip of the cantilever and the sample, force detection means for measuring the deflection of the cantilever, switchable feedback means for controlling said actuator means, said feedback means being switchable to said tunnel current, to said force detection means, or to the output of the amplifying means, and means to apply in operation a DC voltage to said cantilever.

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