CLAIMS

What is claimed is:

1. A high-sensitivity piezoelectric microphone, comprising a wafer substrate provided with a cavity and a plurality of cantilever beams with a piezoelectric deck structure, wherein each of the plurality of cantilever beams comprises a fixed end and a free end suspended above the cavity, each of the plurality of cantilever beams is of a structure in which one end is narrow and the other end is wide, and the relatively narrow end is the fixed end; and a fixed column is disposed at a center of a bottom surface of the cavity, the fixed ends of the plurality of cantilever beams are all connected to a top surface of the fixed column, a gap is provided between every adjacent cantilever beams, the free ends of every two adjacent cantilever beams are all connected to one flexible elastic member that enable the plurality of cantilever beams to vibrate synchronously, and a connecting section used for leading out an electric signal of each of the plurality of cantilever beams is disposed in one gap.

2. The high-sensitivity piezoelectric microphone according to claim 1, wherein each of the plurality of cantilever beams is in a shape of a sector or a trapezoid, and a formed sound pressure receiving region is circular or polygonal.

3. The high-sensitivity piezoelectric microphone according to claim 2, wherein each of the plurality of cantilever beams has a trapezoidal structure and there are four cantilever beams, and the four cantilever beams enclose a rectangular structure.

4. The high-sensitivity piezoelectric microphone according to claim 2, wherein each of the plurality of cantilever beams has a trapezoidal structure and there are six cantilever beams, and the six cantilever beams enclose a hexagonal structure.

5. The high-sensitivity piezoelectric microphone according to claim 2 or 3 or 4, wherein the wafer substrate is a silicon on insulator (SOI) wafer substrate, a top surface of the wafer substrate, the top surface of the fixed column, and the plurality of cantilever beams are all made into single-chip piezoelectric deck structures, and the piezoelectric deck structure sequentially comprises a bottom electrode, a piezoelectric film, and a top electrode from bottom to top.

6. The high-sensitivity piezoelectric microphone according to claim 5, wherein

the plurality of cantilever beams have a single chip structure and sequentially comprises a support layer, the bottom electrode, the piezoelectric film, and the top electrode from bottom to top.

7. The high-sensitivity piezoelectric microphone according to claim 5, wherein the connecting section connects the piezoelectric deck structure on the fixed column and the piezoelectric deck structure on the wafer substrate, and a bottom lead-out electrode used for leading out an electric signal of the bottom electrode and a top lead-out electrode used for leading out an electric signal of the top electrode are disposed on an outer side of the top surface of the wafer substrate.

8. The high-sensitivity piezoelectric microphone according to claim 7, wherein an insulating layer is provided between the bottom lead-out electrode and the top electrode.

9. The high-sensitivity piezoelectric microphone according to claim 7, wherein the bottom electrodes and the top electrodes of the plurality of cantilever beams are all connected in parallel.

10. The high-sensitivity piezoelectric microphone according to claim 1, wherein each flexible elastic member is an elastic waveform structure.

11. The high-sensitivity piezoelectric microphone according to claim 2 or 3 or 4, wherein the wafer substrate is a Si wafer substrate, a top surface of the wafer substrate, the top surface of the fixed column, and the plurality of cantilever beams are all made into dual-chip piezoelectric deck structures, and the piezoelectric deck structure sequentially comprises a lower electrode, a first piezoelectric film, an intermediate electrode, a second piezoelectric film, and an upper electrode from bottom to top.

12. The high-sensitivity piezoelectric microphone according to claim 11, wherein the plurality of cantilever beams have a dual-chip structure and sequentially comprises the lower electrode, the first piezoelectric film, the intermediate electrode, the second piezoelectric film, and the upper electrode from bottom to top.

13. The high-sensitivity piezoelectric microphone according to claim 1, wherein a mass block for reducing a resonance frequency of each of the plurality of cantilever beams is disposed at each of the free ends.

14. The high-sensitivity piezoelectric microphone according to claim 13, wherein the mass block is disposed above, below, or at an end portion of each of the free ends of each of the plurality of cantilever beams.

15. The high-sensitivity piezoelectric microphone according to claim 14, wherein the mass block disposed above each of the free ends of each of the plurality of cantilever beams is formed by patterning a deposited material in one-to-one correspondence.

16. The high-sensitivity piezoelectric microphone according to claim 14, wherein the mass block disposed below each of the free ends of each of the plurality of cantilever beam is formed by performing back cavity etching on a substrate layer.

17. The high-sensitivity piezoelectric microphone according to claim 13, wherein there are the plurality of cantilever beams, the gap is provided between every two adjacent cantilever beams, each cantilever beam comprises the fixed end fixedly connected to the substrate and each of the free ends, and the mass block is disposed at each free end.

18. The high-sensitivity piezoelectric microphone according to any one of claims 13 to 17, further comprising a fixed framework, wherein the fixed framework is disposed on a periphery of the plurality of cantilever beams, a piezoelectric deck corresponding to the plurality of cantilever beams is disposed on the fixed framework, and a piezoelectric deck on the fixed end of the plurality of cantilever beams and the piezoelectric deck on the fixed framework are connected by a piezoelectric deck on the connecting section, to lead out an electric signal from the fixed framework.

19. A high-sensitivity piezoelectric microphone apparatus, comprising a plurality of high-sensitivity piezoelectric microphones connected in series or in parallel, wherein the high-sensitivity piezoelectric microphone is the high-sensitivity piezoelectric microphone according to any one of claims 1 to 18.