Claims

1. A method for forming a piezoelectric device comprising the steps of:

(a) depositing a first electrode layer;

(b) depositing a piezoelectric polymer material layer on said first electrode layer to thereby cover said first electrode layer while leaving a region of said first electrode layer uncovered;

(c) depositing a second electrode layer on said piezoelectric polymer material layer;

(d) depositing a piezoelectric polymer material layer on said second electrode layer to thereby cover said second electrode layer while leaving a region of said second electrode layer uncovered; and

(e) repeating steps (a) to (c), and optionally step (d), to build multiple repeating first electrode layers separated from the second electrode layers by piezoelectric polymer material layers, wherein all of the uncovered regions of said first electrode layers converge at a point A to integrally form a first electrode and all of the uncovered regions of said second electrode layers converge at a point B to integrally form a second electrode, in which point A is displaced at a distance from point B.

2. The method according to claim 1, further comprising the step of heating the substrate after each piezoelectric polymer material layer depositing step to thereby improve the piezoelectric property of the piezoelectric polymer material layer.

3. The method according to claim 1 or claim 2, wherein said first and second electrode layers are deposited via vapor deposition.

4. The method according to claim 3, wherein said vapor deposition is physical vapor deposition.

5. The method according to claim 4, wherein said physical vapor deposition comprises electron-beam evaporation.

6. The method according to any one of the preceding claims, wherein said first and second electrode layers are deposited through a mask.

7. The method according to any one of the preceding claims, wherein said first and second electrode layers independently comprise a metal.

8. The method according to claim 7, wherein said first and second electrode layers are comprised of aluminium.

9. The method according to any one of the preceding claims, wherein the step of depositing the piezoelectric polymer layers comprises the step of dip coating.

10. The method according to any one of the preceding claims, wherein said piezoelectric polymer material layers comprise an organic polymer.

11. The method according to claim 10, wherein said organic polymer is a ferroelectric polymer.

12. The method according to claim 11, wherein said ferroelectric polymer comprises monomers selected from the group consisting of vinyls, vinylidene halides, acrylonitriles, amides, fluoroethylenes, halides and combinations thereof.

13. The method according to claim 11 or claim 12, wherein said ferroelectric polymer is PVDF-based polymer.

14. The method according to any one of claims 11 to 13, wherein said ferroelectric polymer is poly(vinylidene fluoride and trifluoroethylene).

15. The method according to claim 13, wherein said PVDF-based polymer is PVDF homopolymer in admixture with a hydrated salt.

16. A piezoelectric device comprising a plurality of repeating layers having the following sequence:

(a) a first electrode layer,

(b) a piezoelectric polymer material layer covering said first electrode layer while leaving a region of said first electrode layer uncovered,

(c) a second electrode layer, and optionally

(d) a piezoelectric polymer material layer covering said second electrode layer while leaving a region of said second electrode layer uncovered,

wherein all of the uncovered regions of said first electrode layers are integrally formed and connected together at a point A and all of the uncovered regions of said second electrode layers are integrally formed and connected together at a point B wherein point A is displaced at a distance from point B.

17. The piezoelectric device according to claim 16, wherein said first electrode layer is deposited on a substrate made of a flexible material.

18. The piezoelectric device according to claim 16 or claim 17, wherein said first and second electrode layers independently comprise a metal.

19. The piezoelectric device according to any one of claims 16 to 18, wherein said piezoelectric polymer material layers comprise an organic polymer.

20. The piezoelectric device according to claim 19, wherein said organic polymer is a ferroelectric polymer.

21. The piezoelectric device according to claim 20, wherein said ferroelectric polymer comprises monomers selected from the group consisting of vinyls, vinylidene halides, acrylonitriles, amides, fluoroethylenes, halides and combinations thereof.

22. The piezoelectric device according to any one of claims 16 to 21, wherein the thickness of said first and second electrode layers are individually selected from the range of 0.05 μm to 1 μm.

23. The piezoelectric device according to any one of claims 16 to 22, wherein the thickness of said piezoelectric polymer material layers are individually selected from the range of 2 μm to 30 μm.

24. The piezoelectric device according to any one of claims 18 to 23, wherein the thickness ratio of the

piezoelectric polymer material layer to the respective electrode layer is more than 20.

25. The piezoelectric device according to claim 24, wherein the thickness ratio of the piezoelectric polymer material layer to the respective electrode layer is more than 50.

26. An energy storage device comprising the piezoelectric device according to any one of claims 16 to 25.

27. A wafer of piezoelectric devices comprising:

a substrate; and

a plurality of piezoelectric devices according to any one of claims 16 to 25 disposed on said substrate.