

wherein said piezoelectric ceramic material is one or more of: embedded within, disposed within, and/or attached to said device or structure associated with the self-powered electronic device; and

electrical circuitry electrically coupling said self-powered electronic device to said device or structure associated with said self-power electronic device; and

wherein said self-powered electronic device receives a charge from said device or structure associated with said self-power electronic device.

15. The device of claim 4, wherein said energy harvesting system further comprises:

an energy storage device electrically coupled to said piezoelectric ceramic material for storing harvested energy; and

a rectifier electrically coupled between said energy storage device and said piezoelectric ceramic material, wherein said rectifier converts energy from alternating current (AC) to direct current (DC) prior to storage in said energy storage device.

16. The device of claim 6, wherein said piezoelectric ceramic fibers are positioned and oriented such that mechanical energy input is substantially in a direction parallel to a longitudinal axis of said fibers.

17. The device of claim 6, wherein said piezoelectric ceramic fibers are positioned and oriented to maximize a longitudinal length of said fibers.

18. The device of claim 6, wherein said piezoelectric ceramic fibers are positioned and oriented to maximize a number and concentration of said fibers.

19. The device of claim 6, wherein said piezoelectric ceramic fibers are oriented in parallel array with a poling direction of said fibers being in the same direction.

20. The device of claim 6, wherein adjacent piezoelectric ceramic fibers are in contact with one another.

21. The device of claim 6, wherein said piezoelectric ceramic fibers are oriented in a star array having a center and individual fibers extending outward from said center, wherein a poling direction of said fibers is toward said center of said star array.

22. A self-powered, portable electronic device comprising:

a housing;

ultra low power electronics housed within the housing; and

high charge piezoelectric ceramic fibers and/or fiber composites embedded within, disposed within, or attached to said portable electronic device, wherein said piezoelectric ceramic fibers and/or fiber composites harvest increased deliverable power from mechanical inputs to said portable electronic device;

wherein said piezoelectric ceramic fibers and/or fiber composites are electrically coupled to said ultra low power electronics to power said ultra low power electronics; and

wherein integration and convergence of ultra low power electronics and high charge piezoelectric ceramic fibers

and/or fiber composites enable said portable electronic device to be partially or fully self-powered.

23. A method of self-powering an electronic device comprising:

(a) incorporating an energy harvesting system comprising a piezoelectric ceramic material into a portable electronic device;

(b) positioning and orienting the piezoelectric ceramic material at one or more mechanical energy input points;

(c) generating a charge in the piezoelectric ceramic material from a mechanical energy input at the mechanical energy input points,

(d) powering a load from the charge generated in the piezoelectric ceramic material.

24. The method of claim 23, wherein the load is powered directly from the charge generated in the piezoelectric ceramic material.

25. The method of claim 23 further comprising the step of collecting the charge from the piezoelectric ceramic material using electrical circuitry.

26. The method of claim 25 further comprising the step of storing the charge from the piezoelectric ceramic material in an energy storage device.

27. The method of claim 26, wherein the load is powered using the stored energy.

28. The method of claim 23, wherein the mechanical energy is input through normal use of the portable electronic device.

29. The method of claim 23, wherein the piezoelectric ceramic material comprises piezoelectric ceramic fibers.

30. The method of claim 29, wherein the piezoelectric ceramic fibers comprise one or more of: a piezoelectric fiber composite (PFC); a piezoelectric fiber composite bimorph (PFCB); and/or a piezoelectric multilayer composite (PMC).

31. A self-powered, portable electronic device comprising:

a housing;

electronics housed within the housing;

a piezoelectric ceramic material for harvesting increased deliverable power from mechanical inputs to the portable electronic device, wherein the piezoelectric ceramic material is electrically coupled to the electronics to power the electronics.

32. The device of claim 31, wherein the piezoelectric ceramic material comprises piezoelectric ceramic fibers.

33. The device of claim 32, wherein the piezoelectric ceramic fibers comprise one or more of: a piezoelectric fiber composite (PFC); a piezoelectric fiber composite bimorph (PFCB); and/or a piezoelectric multilayer composite (PMC).

34. The device of claim 31, wherein the electronics are ultra low power electronics.

35. The device of claim 34, wherein integration and convergence of the ultra low power electronics and the piezoelectric ceramic material enables the self-powered, portable electronic device.