[0325] In some embodiments, the antenna is a thin-film trace deposited on the electronic communications circuit.

[0326] In some embodiments, the antenna is a thin-film trace deposited on the support structure.

[0327] In some embodiments, the electronic circuit includes a recharging circuit that recharges the battery using energy received by the antenna.

[0328] Some embodiments further include a photovoltaic cell, wherein the electronic circuit includes a recharging circuit that recharges the battery using energy received by the photovoltaic cell.

[0329] Another aspect of the present invention provides a method for making an integrated combined battery and wireless-communications apparatus. This method includes providing a support structure, depositing a first conductive layer on a first surface area of the support structure, depositing a thin-film battery including a cathode layer, a solid-state electrolyte layer, and an anode layer deposited such that either the anode layer or the cathode layer is in electrical contact with the first conductive layer, and the electrolyte layer in contact with and completely separating the anode layer and the cathode layer, mounting an antenna to the support structure, mounting an electronic communications circuit to the support structure, and electrically coupling the electronic communications circuit to the battery and the antenna to transceive radio communications.

[0330] In some embodiments of the method, the anode or the cathode or both include an intercalation material or a metal or both.

[0331] In some embodiments, the depositing of the thin-film battery includes depositing a lithium intercalation material on the first conductive layer as the cathode layer, and depositing the electrolyte layer on the cathode layer, wherein the electrolyte layer includes LiPON.

[0332] In some embodiments of the method, the depositing of the thin-film battery includes depositing a lithium cobalt oxide material on the first conductive layer as the cathode layer, and depositing the electrolyte layer on the cathode layer, wherein the electrolyte layer includes LiPON.

[0333] In some embodiments of the method, the depositing of the thin-film battery includes depositing the cathode layer on the first conductive layer, depositing the electrolyte layer on the cathode layer, wherein the electrolyte layer includes LiPON, and depositing the anode layer including a lithium intercalation material on the electrolyte layer.

[0334] In some embodiments of the method, the support structure has a curved shape having a convex face and a concave face, and the battery is located on the concave face.

[0335] In some embodiments of the method, the mounting of the antenna includes depositing a thin-film trace on the battery.

[0336] In some embodiments of the method, the mounting of the antenna includes depositing a thin-film trace on the electronic communications circuit.

[0337] In some embodiments of the method, mounting of the antenna includes depositing a thin-film trace on the support structure.

[0338] In some embodiments of the method, the electronic circuit includes a recharging circuit that recharges the battery using energy received by the antenna.

[0339] Some embodiments of the method further include mounting a photovoltaic cell to the support structure, wherein the electronic circuit includes a recharging circuit that recharges the battery using energy received by the photovoltaic cell.

[0340] Yet another aspect of the present invention provides a combined battery and wireless-recharging apparatus including a support structure, a first conductive layer deposited on a first surface area of the support structure, a thin-film battery including a cathode layer, a solid-state electrolyte layer, and an anode layer deposited such that either the anode layer or the cathode layer is in electrical contact with the first conductive layer, and the electrolyte layer in contact with and completely separating the anode layer and the cathode layer, an energy-receiving device mounted to the support structure, and an electronic communications circuit mounted to the support structure and including a recharging circuit, the recharging circuit electrically coupled to the battery and the energy-receiving device to recharge the battery using energy received by the energy-receiving device.

[0341] In some embodiments of this apparatus, the anode or the cathode or both include an intercalation material or a metal or both, and wherein the electrolyte layer includes LiPON.

[0342] In some embodiments of this apparatus, the cathode layer includes lithium cobalt oxide deposited on the first conductive layer, and wherein the electrolyte layer includes LiPON.

[0343] In some embodiments of this apparatus, the energy-receiving device includes a photovoltaic cell.

[0344] In some embodiments of this apparatus, the energy-receiving device includes an antenna.

[0345] In some embodiments of this apparatus, the energy-receiving device includes an electromechanical electric generator.

[0346] In some embodiments of this apparatus, the energy-receiving device includes an acoustic transducer.

[0347] Some embodiments of this apparatus further include a magnetic transducer.

[0348] Some embodiments of this apparatus further include an acoustic transducer.

[0349] In some embodiments, the apparatus operates as a hearing aid. In some embodiments, the apparatus operates as an implantable medical device. In some embodiments, the apparatus operates as a timepiece, for example as a watch.

[0350] It is to be understood that the above description is intended to be illustrative, and not restrictive. Although numerous characteristics and advantages of various embodiments as described herein have been set forth in the foregoing description, together with details of the structure and function of various embodiments, many other embodiments and changes to details will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to