[0007] One or more structures provided may be created using an apparatus that includes one or more first electrodes that define an area and/or partially circumscribe an area. For example, a single first electrode may enclose the area, or a plurality of first electrode(s) may be positioned on at least a portion of the perimeter of the area. A second electrode is positioned within the area. In exemplary embodiments, when the electrodes are electrically charged at a first polarity, and a spinneret dispensing a polymer (e.g., toward the second electrode) is electrically charged at a second polarity opposite the first polarity, the dispensed polymer forms a plurality of fibers extending from the second electrode to the first electrodes. Further, electrodes with rounded (e.g., convex) surfaces may be arranged in an array, and a fibrous structure created using such electrodes may include an array of wells at positions corresponding to the positions of the electrodes.

[0007a] In one aspect, there is provided a system for producing a structure including a plurality of fibers, the system comprising:

one or more first electrodes defining an area;

a second electrode positioned within the area; and

a spinneret configured to dispense a polymer while the one or more first electrodes and the second electrode are charged at a first polarity and the spinneret is electrically charged at a second polarity opposite the first polarity,

wherein the dispensed polymer forms a plurality of fibers extending from the second electrode to the first electrodes.

[0007b] In one aspect, there is provided an apparatus for producing a structure including a plurality of fibers, the apparatus comprising:

a plurality of first electrodes at least partially circumscribing an area;

a second electrode positioned within the area and electrically coupled to the first electrodes; and

a power supply electrically coupled to the first electrodes and the second electrode, wherein the power supply is configured to electrically charge the first electrodes and the second electrode at a first polarity,

wherein when a spinneret approximately aligned with the second electrode and charged at a second polarity opposite the first polarity dispenses a polymer, the dispensed polymer forms a plurality of fibers extending from the second electrode to the first electrodes.

[0007c] In one aspect, there is provided a system for producing a structure including radially aligned fibers, the system comprising:

a first electrode defining an enclosed area;

a second electrode positioned approximately at a center of the enclosed area; and

a spinneret configured to dispense a polymer while the first electrode and the second electrode are charged at a first polarity and the spinneret is electrically charged at a second polarity opposite the first polarity,

wherein the dispensed polymer forms a plurality of fibers extending from the second electrode to the first electrode.

[0007d] In one aspect, there is provided a method for producing a structure of fibers, the method comprising:

electrically charging one or more first electrodes that define an area at a first polarity;

electrically charging a second electrode positioned within the defined area at the first polarity;

electrically charging a spinneret at a second polarity opposite the first polarity, wherein the spinneret is approximately aligned with the second electrode; and

dispensing a polymer from the spinneret to create a structure of fibers extending from the second electrode to the one or more first electrodes.

[0007e] In one aspect, there is provided a fiber structure for repairing a void in a biological tissue, the fiber structure defining a center and a perimeter, the fiber structure comprising a plurality of radially aligned polymeric fibers extending between the center and the perimeter.

[0007f] In one aspect, there is provided a method for repairing a defect in a biological tissue, the method including:

selecting a biomedical patch capable of covering the void and including a plurality of radially aligned polymeric fibers extending from a center of the biomedical patch to a perimeter of the biomedical patch; and

applying the biomedical patch to the biological tissue to cover at least a portion of the defect.

[0008] This summary introduces a subset of concepts that are described in more detail below. This summary is not meant to identify essential features, and should not be read as limiting in any way the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The embodiments described herein may be better understood by referring to the following description in conjunction with the accompanying drawings.

[0010] FIG. 1 is a diagram illustrating a perspective view of an example electrospinning system for producing a structure of radially aligned fibers.

[0011] FIG. 2 is a diagram illustrating an electric field generated by the electrospinning system shown in FIG. 1.

[0012] FIG. 3 is a diagram of an electrode removed from the electrospinning system shown in FIG. 1 and having a plurality of fibers deposited thereon forming a biomedical patch.

[0013] FIG. 4 is a photograph of a biomedical patch including a plurality of radially aligned electrospun fibers deposited on a peripheral electrode.

[0014] FIG. 5 is a scanning electron microscope (SEM) image of the biomedical patch shown in FIG. 4, further illustrating that the fibers of the biomedical patch are radially aligned.

[0015] FIG. 6 is an illustration of a solid fiber spinneret.

[0016] FIG. 7 is an illustration of a hollow fiber spinneret.

[0017] FIG. 8 is an illustration of a biomedical patch layer with a plurality of randomly oriented fibers, a biomedical patch layer with a plurality of radially aligned fibers, and a multi-layer biomedical patch including multiple orders of fibers.

[0018] FIG. 9 is a diagram of a collector with a central electrode, an inner peripheral electrode defining an inner enclosed area, and an outer peripheral electrode defining an outer enclosed area.

[0019] FIG. 10 is a diagram of a concentric biomedical patch that may be produced utilizing the collector shown in FIG. 9 in conjunction with the electrospinning system shown in FIG. 1.