CLAIMS

1. A method for forming structures upon a substrate, the method comprising:

depositing fluid onto a substrate so as to define a wetted region, the fluid containing electrically polarizable nanoparticles;

applying an alternating electric field to the fluid on the region, using a first electrode and a second electrode, so that a plurality of the nanoparticles are assembled to form an elongate structure extending from the first electrode towards the second electrode; and

removing the fluid such that the elongate structure remains upon the substrate,

further comprising, during the step of applying the alternating electric field, increasing the separation between the first and second electrodes by moving the second electrode away from the first electrode so as to further extend the elongate structure towards the second electrode.

2. A method according to claim 1, wherein the relationship between the rate at which the length of the assembled elongate structure is increased and the rate at which the separation between the first and second electrodes is increased causes the separation between an end part of the structure and an electrode to be such that the electric field in a region of the fluid proximal to the electrode and the end part of the structure causes mobile nanoparticles in that region to assemble upon the end part of the structure.

3. A method according to claim 1 or claim 2, further comprising monitoring the rate at which the length of the elongate structure is increasing; and

adjusting the properties of the alternating electric field in accordance with the monitored rate, such that the length of the elongate structure is increased at a predetermined rate.

4. A method according to any of the preceding claims, wherein at least one of the electrodes has an elongate shape comprising a pointed end, and wherein applying an alternating electric field to the fluid comprises bringing the pointed end of each of the electrodes into contact with the fluid.

5. A method according to any of the preceding claims, wherein the electric field is applied such that a dielectrophoretic force is exerted upon the plurality of nanoparticles and causes mobile nanoparticles within the fluid to be attracted via the dielectrophoretic force to the assembled structure.

6. A method according to any of the preceding claims, wherein the electric field has a DC bias, and wherein the DC bias is such that a first end of the structure is formed by mobile nanoparticles within the fluid attaching to the first electrode.

7. A method according to any of the preceding claims, wherein the first electrode or the second electrode comprises a conduit, and wherein the fluid is deposited onto the substrate via the conduit.

8. A method according to any of the preceding claims, wherein the first and second electrodes are connected to a controller configured to control an alternating electric current between the electrodes such that the current has an AC amplitude in the range 1–10,000 μA and a DC bias in the range 0.1–1,000 μA.

9. A method according to claim 8, wherein the potentiometer is configured to control the alternating electric current such that the AC amplitude is in the range 10–1,000 μA and the DC bias is in the range 1–100 μA.

10. A method according to any of the preceding claims, comprising moving the second electrode along a predetermined path corresponding to the shape of the wetted region on the substrate, thereby assembling the structure such that the structure extends along the predetermined path from a first end position to a second end position within the region.

11. A method according to any of the preceding claims, wherein the step of applying the electric field is repeated for fluid deposited on a second wetted region on the substrate, so as to form a second structure, wherein the second

structure extends from a first end position within the second region to a second end position within the second region, and wherein either of the first or second end positions of the second region coincides with the structure formed on the first region.

12. A method according to any of the preceding claims, wherein the method further comprises a sintering process, wherein the sintering process causes assembled nanoparticles to coalesce so as to increase the firmness of the assembled structure.

13. An assembly comprising a substrate having an elongate structure formed upon it, produced according to the method of claim 1,

wherein the elongate structure has a sub-micrometre line width and a line length in the order of several centimetres.

14. An apparatus for forming structures upon a substrate, the apparatus comprising:

a print head for depositing fluid containing electrically polarizable nanoparticles onto a substrate,

a first electrode and a second electrode for applying an alternating electric field to a wetted region defined by fluid deposited by the print head when each of the first and second electrodes is in contact with the fluid, wherein the second electrode is moveable with respect to the first electrode and

a fluid removal device for removing deposited fluid from the substrate.

15. An apparatus according to claim 14, further comprising a signal controller configured to control an alternating electrical signal to the first and second electrodes so as to apply an alternating electric field between the first and second electrodes.