Claims

1. A method of preparing a patterned anisotropic-comprising composite material, the method comprising:

- inserting at least a part of a heated probe into a matrix to induce a local phase change around the probe within the matrix, wherein the matrix is a matrix of thermo-reversible material and anisotropic fillers; and
- moving the heated probe within the matrix, thereby aligning the anisotropic fillers to form an alignment pattern of the anisotropic fillers comprised in the matrix.

2. The method according to claim 1, further comprising:

- removing the heated probe from the matrix; and
- cooling the patterned anisotropic-comprising composite material.

3. The method according to claim 1 or 2, wherein the patterned anisotropic-comprising composite material is a reconfigurable patterned anisotropic-comprising composite material.

4. The method according to any preceding claim, wherein the thermo-reversible material comprises: a polymer, a polymer-derivative, a hydrocarbon-derivative, or a combination thereof.

5. The method according to any preceding claim, wherein the thermo-reversible material is selected from: elastomer, plastic, organogel, oleogel, hydrogel, aerogel, metal-organic gel, wax, or a combination thereof.

6. The method according to any preceding claim, wherein the anisotropic fillers comprise materials which are one-dimensional (1-D) or two-dimensional (2-D).

7. The method according to claim 6, wherein the anisotropic fillers comprise: 1-D homostructures, 1-D heterostructures, 2-D structures, or a combination thereof.

8. The method according to any preceding claim, wherein the anisotropic fillers comprise: rods, tubes, wires, fibres, sheets, lamellar structures of carbon-based, metal-based, oxide-based, chalcogen-based, organic-based, polymer-based materials, or a combination thereof.

9. The method according to any preceding claim, wherein the alignment pattern is linear, non-linear, or a combination thereof.

10. The method according to any preceding claim, wherein the alignment pattern is controlled by adjusting the: dimensions of the probe, temperature at which the probe is heated, speed at which the probe is moved during the movement, or a combination thereof.

11. The method according to any preceding claim, further comprising forming the matrix prior to the inserting, wherein the forming comprises: setting a mixture of thermo-reversible material and anisotropic filler in a mold, depositing and curing a mixture of thermo-reversible material and anisotropic filler on a substrate, or 3-dimensional (3D) printing an ink comprising a mixture of thermo-reversible material and anisotropic filler.

12. The method according to any preceding claim, further comprising reconfiguring the patterned anisotropic-comprising composite material.

13. The method according to claim 12, wherein the reconfiguring the patterned anisotropic-comprising composite material comprises heating the composite material above its phase-transition temperature.

14. A patterned anisotropic-comprising composite material ~~formed from the method according to any preceding claim~~comprising a matrix of thermo-reversible material and anisotropic fillers, wherein the anisotropic fillers are aligned to form an alignment pattern in the matrix, the alignment pattern comprising nanomaterial and/or micromaterial orientation and further wherein the alignment pattern is linear, non-linear, or a combination thereof.

15. The patterned anisotropic-comprising composite material according to claim ~~15~~14, wherein the material is a reconfigurable patterned anisotropic-comprising composite material.