CLAIMS:

1. A composition comprising polymer particles and functionalised stimulus responsive polymer;

the polymer particles (i) comprising block co-polymer, and (ii) having a core-shell structure, said block co-polymer comprising (a) a non-stimulus responsive polymer block that forms at least part of the core structure, and (b) a stimulus responsive polymer block that forms at least part of the shell structure;

wherein the stimulus responsive polymer of both the polymer particles and the functionalised stimulus responsive polymer (iii) comprises polymerised N-isopropylacrylamide, and (iv) is responsive to at least one common stimulus.

2. The composition according to claim 1 further comprising a liquid, wherein the stimulus responsive polymer associated with both the polymer particles and the functionalised stimulus responsive polymer are soluble within the liquid.

3. The composition according to claim 1 further comprising a liquid and being in the form of a gel, wherein the stimulus responsive polymer associated with both the polymer particles and the functionalised stimulus responsive polymer are insoluble within the liquid.

4. A cell culture system comprising the composition according to any one of claims 1 to 3.

5. A drug delivery system comprising the composition according to any one of claims 1 to 3, wherein the functionalised stimulus responsive polymer is functionalised with a drug.

6. A method of culturing cells, said method comprising:

(i) providing a liquid composition comprising polymer particles and cell functionalised stimulus responsive polymer;

the polymer particles (a) comprising block co-polymer, and (b) having a core-shell structure, said block co-polymer comprising (a) a non-stimulus responsive polymer block that forms at least part of the core structure, and (b) a stimulus responsive polymer block that forms at least part of the shell structure;

wherein the stimulus responsive polymer of both the polymer particles and the cell functionalised stimulus responsive polymer (a) comprises polymerised N-isopropylacrylamide, (b) is responsive to at least one common stimulus, and (c) is soluble in the liquid;

(ii) subjecting the liquid composition to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the cell functionalised stimulus responsive polymer to transition from being soluble in the liquid to being insoluble in the liquid, wherein said transition promotes aggregation of the polymer particles and the cell functionalised stimulus responsive polymer to form cell clusters; and

(iii) culturing cells within and/or on said cell clusters.

7. The method according to claim 6 further comprising a step of:

(iv) subjecting the liquid composition comprising the cultured cells to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the cell functionalised stimulus responsive polymer to transition from being insoluble in the liquid to being soluble in the liquid, wherein said transition facilitates release from said cell clusters of individual cells and/or smaller cell clusters.

8. The method according to claim 7 further comprising a step of:

(v) removing from the liquid composition at least some of the so formed individual cells and/or smaller cell clusters formed in step (iv).

9. The method according to any one of claims 6 to 8, wherein the liquid is an aqueous liquid and the stimulus responsive polymer of both the polymer particles and the cell functionalised stimulus responsive polymer is a thermoresponsive polymer having a common Lower Critical Solution Temperature (LCST).

10. The method according to claim 9, wherein said common stimulus applied in step (ii) is increasing the temperature of the liquid above the LCST.

11. The method according to claim 9 or 10, wherein 37 °C is at or above the LCST.

12. A method of culturing cells, said method comprising:

(i) providing a liquid composition comprising, a liquid, cell receptor ligand functionalised stimulus responsive polymer and polymer particles secured to a substrate;

the polymer particles (a) comprising block co-polymer, and (b) having a core-shell structure, said block co-polymer comprising (a) a non-stimulus responsive polymer block that forms at least part of the core structure, and (b) a stimulus responsive polymer block that forms at least part of the shell structure;

wherein the stimulus responsive polymer of both the polymer particles and the cell receptor ligand functionalised stimulus responsive polymer (a) comprises polymerised N-isopropylacrylamide, (b) is responsive to at least one common stimulus, and (c) is soluble in the liquid;

(ii) subjecting the liquid composition to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the cell receptor ligand functionalised stimulus responsive polymer to transition from being soluble in the liquid to being insoluble in the liquid, wherein said transition promotes aggregation of the polymer particles and the cell receptor ligand functionalised stimulus responsive polymer to form an aggregate structure with a surface comprising the cell receptor ligand;

(iii) introducing to the liquid one or more cells that are to be cultured such that it or they bind with a cell receptor ligand; and

(iv) culturing cells upon said surface comprising the cell receptor ligand.

13. The method according to claim 12 further comprising a step of:

(v) subjecting the liquid composition comprising the cultured cells to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the cell receptor ligand functionalised stimulus responsive polymer to transition from being

insoluble in the liquid to being soluble in the liquid, wherein said transition facilitates release of said cultured cells .

14. The method according to claim 13 further comprising a step of:

(vi) removing from the liquid composition at least some of the cultured cells formed in step (v).

15. The method according to any one of claims 12 to 14, wherein the liquid is an aqueous liquid and the stimulus responsive polymer of both the polymer particles and the cell receptor ligand functionalised stimulus responsive polymer is a thermoresponsive polymer having a common Lower Critical Solution Temperature (LCST).

16. The method according to claim 15, wherein said common stimulus applied in step (ii) is increasing the temperature of the liquid composition above the LCST.

17. The method according to claim 15 when dependant on claim 13, wherein said common stimulus applied in step (v) is decreasing the temperature of the liquid composition below the LCST.

18. The method according to claim 15, 16, or 17, wherein 37 °C is at or above the LCST.

19. A method of forming a gel comprising functionalised stimulus responsive polymer, said method comprising:

(i) providing a liquid composition comprising a liquid, polymer particles and functionalised stimulus responsive polymer;

the polymer particles (a) comprising block co-polymer, and (b) having a core-shell structure, said block co-polymer comprising (a) a non-stimulus responsive polymer block that forms at least part of the core structure, and (b) a stimulus responsive polymer block that forms at least part of the shell structure;

wherein the stimulus responsive polymer of both the polymer particles and the functionalised stimulus responsive polymer (a) comprises polymerised N-

isopropylacrylamide, (b) is responsive to at least one common stimulus, and (c) is soluble in the liquid; and

(ii) subjecting the liquid composition to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the functionalised stimulus responsive polymer to transition from being soluble in the liquid to being insoluble in the liquid, wherein said transition promotes formation of the gel.

20. A method of releasing from a gel a functionalised stimulus responsive polymer, said method comprising:

(i) providing a gel comprising polymer particles, a functionalised stimulus responsive polymer and liquid;

the polymer particles (a) comprising block co-polymer, and (b) having a core-shell structure, said block co-polymer comprising (a) a non-stimulus responsive polymer block that forms at least part of the core structure and (b) a stimulus responsive polymer block that forms at least part of the shell structure;

wherein the stimulus responsive polymer of both the polymer particles and the functionalised stimulus responsive polymer (a) comprises polymerised N-isopropylacrylamide, (b) is responsive to at least one common stimulus, and (c) is insoluble in the liquid; and

(ii) subjecting the gel to said common stimulus so as to cause the stimulus responsive polymer of both the polymer particles and the functionalised stimulus responsive polymer to transition from being insoluble in the liquid to being soluble in the liquid, wherein said transition causes the gel to become a liquid composition comprising the polymer particles and the functionalised stimulus responsive polymer, thereby promoting release of the functionalised stimulus responsive polymer from the gel.