Claims

1. An antimicrobial plastic comprising: a hydrophobic thermoplastic polymer and a hydrophilic polycationic polymer, wherein the hydrophilic polycationic polymer forms semi-free surface nanostructures with the hydrophobic thermoplastic polymer, the semi-free surface nanostructures capable of electrostatically bonding with bacterial components.

2. The plastic according to claim 1, wherein the hydrophilic polycationic polymer is a functionalised poly-imidazolium polymer.

3. The plastic according to claim 2, wherein the functionalised poly-imidazolium polymer comprises an alkenyl terminal group at each of its ends.

4. The plastic according to claim 3, wherein the alkenyl terminal group comprises a vinyl group.

5. The plastic according to any of claims 2 to 4, wherein the functionalised poly-imidazolium polymer comprises PIM-Vinyl.

6. The plastic according to any preceding claim, wherein the hydrophilic polycationic polymer is covalently linked within a main chain of the hydrophobic thermoplastic polymer via covalent bonds.

7. The plastic according to any preceding claim, wherein the plastic comprises 0.1-10 wt % hydrophilic polycationic polymer based on the total weight of the plastic.

8. The plastic according to any preceding claim, wherein the hydrophobic thermoplastic polymer is: polystyrene, polyacrylate, copolymers or mixtures thereof.

9. The plastic according to any preceding claim, wherein the plastic has a surface roughness of ≥ 50 nm.

10. A method of preparing the plastic according to any preceding claim, the method comprising:

- mixing a hydrophilic polycationic polymer and monomer units of the hydrophobic thermoplastic polymer with a solvent to form a mixture;
- adding an initiator;
- heating the mixture; and
- precipitating the plastic.

11. The method according to claim 10, wherein the mixture comprises 0.1-10 wt % hydrophilic polycationic polymer based on the total weight of the mixture.

12. The method according to claim 10 or 11, wherein the heating results in the co-polymerisation of the hydrophilic polycationic polymer with the monomer units of the hydrophobic thermoplastic polymer.

13. The method according to claim 12, wherein the co-polymerisation results in the hydrophilic polycationic polymer becoming covalently linked within a main chain of the hydrophobic thermoplastic polymer via covalent bonds.

14. The method according to any of claims 10 to 13, wherein the precipitating the plastic comprises surface phase separation of the hydrophilic polycationic polymer on the plastic, thereby forming semi-free surface nanostructures on the plastic.