We claim:

1. 1. A **method of producing a thermoplastic binder** comprising obtaining a processed thermoplastic as

- a functionalised thermoplastic, the functionalised thermoplastic having been processed by substantially melting a thermoplastic in an extruder to define an extruder melt zone, and reacting the thermoplastic with a coupling agent in the extruder,
- a thermoplastic dispersion, the thermoplastic dispersion having been processed by substantially melting a thermoplastic in an extruder to define an extruder melt zone, and subsequently dispersing the thermoplastic in water under agitation in an extruder emulsification zone, or
- a functionalised thermoplastic dispersion, the functionalised thermoplastic dispersion having been processed by
  - substantially melting a thermoplastic in an extruder to define an extruder melt zone,
  - reacting the thermoplastic with a coupling agent in an extruder to produce a functionalised thermoplastic, and
  - subsequently dispersing the functionalised thermoplastic in water under agitation in an extruder emulsification zone; and

subsequently adding a crosslinker to the processed thermoplastic to produce a binder, and wherein the binder does not comprise wood fibre.

2. A **method of producing a thermoplastic composite product** comprising:

providing a source of thermoplastic,

introducing the thermoplastic into an inlet end of one or more extruders,

within the one or more extruders, substantially melting the thermoplastic to define a melt zone, wherein

a) at least a portion thereof of the thermoplastic is reacted with a coupling agent to produce a functionalised thermoplastic,

b) dispersing the thermoplastic in water under agitation to produce a thermoplastic dispersion, or

c) performing (a) and subsequently (b) to produce a functionalised thermoplastic dispersion; and

subsequently adding a crosslinker to the functionalised thermoplastic or thermoplastic dispersion, , extruding the functionalised thermoplastic or thermoplastic dispersion via an outlet of the one or more extruders to produce a binder, wherein the cross linker is added to the extruder, or to the extruded functionalised thermoplastic or thermoplastic dispersion and

mixing the binder with a substrate in the form of a fibre to form a composite mixture and applying heat and pressure to the composite mixture in a press or mould to form a thermoplastic composite product.

3. A method of any one of claims 1 or 2 wherein the source of thermoplastic comprises waste thermoplastic.

4. A method of any one of claims 1 to 3 wherein the thermoplastic is subjected to a pre-processing step comprising

a) increasing the melt flow index of the thermoplastic,
b) washing the thermoplastic,
c) comminuting the thermoplastic to reduce the variance of a particle size of the thermoplastic,
d) standardisation of the particle size and/or density,
e) palletisation to a particle size of 2-8 mm, or
f) any combination of one or more of (a) to (e).

5. A method of any one of claims 1 to 4 wherein the thermoplastic is subjected to a characterising step that analyses one or more physical property of the thermoplastic.

6. A method of any one of claims 1 to 5 wherein the thermoplastic is subjected to a pre-processing step, and wherein increasing the melt flow index of the thermoplastic comprises

i. processing the thermoplastic through an extruder,
ii. the addition of a melt-flow increasing additive to the extruder,
iii. the addition of a further thermoplastic with a higher melt-flow index, or
iv. any combination of (i) to (iii).

7. A method of any one of claims 1 to 6 wherein the coupling agent is selected from a grafting compatibiliser or a reactive hydrogen provider.

8. A method according to any one of claims 1 to 7 wherein the coupling agent is selected from glycidyl methacrylate, maleic anhydride, acrylic acid, glycidyl methacrylate, N-vinylformamide, bismaleimide or a silane.

9. A method of any one of claims 1 to 8 wherein the thermoplastic is dispersed in water with the addition of a surfactant.

10. A method of any one of claims 1 to 9, wherein the cross linker is selected from an organic peroxide or an isocyanate.

11. A method of claim 10 wherein isocyanate is added at 5% to 20% by weight of the binder.

12. A method of any one of claims 1 to 11 wherein the moisture content of the binder is about 25% to about 75%.

13. A method of any one of claims 1 to 12 wherein the emulsification zone comprises a dilution zone for the addition of further water, to obtain a ratio of thermoplastic to water of about 0.8:1 to 1.8:1.

14. A method of any one of claims 2 to 13 wherein the binder and the substrate fibre are mixed in a mixer to form a substantially homogeneous mixture.

15. A method of any one of claims 2 to 14 wherein the substrate fibre is selected from glass fibre, carbon fibre, aramid fibre, sawdust, wood fibre, wood particles, wood chips, wood sheets, coconut husk, rice straw or husk, barley straw, bamboo or a combination thereof.

16. A method of any one of claims 2 to 14 further comprising the step of forming a thermoplastic composite product, wherein the composite mixture has a moisture content of around 5% to around 15%.

17. A method of any one of claims 1 to 28 wherein the plastic particles in the thermoplastic dispersion or the binder have a particle size of less than 0.5 mm in length in any orientation or axis.

18. A method of any one of claims 2 to 16 in the manufacture of

a) a lignocellulosic thermoplastic composite product,
b) a synthetic fibre composite product, or
c) a concrete composite product.

19. A method of any one of claims 2 to 17 in the manufacture of a lignocellulosic thermoplastic composite board having

a) a modulus of elasticity of between about 1,000 to about 4,000 MPa
b) a modulus of rupture of about 10 to about 25 MPa
c) a screw holding of about 200 to about 500 N
d) a density of about 550 to about 1,100 kg/m^3, or
e) any combination of one or more of (a) to (d).

20. A **composite board** comprising:

a) waste thermoplastic;
b) lignocellulosic material; and
c) a cross-linker,

wherein the lignocellulosic material comprises at least 75% of the composite board.

21. The composite board of claim 19, wherein the cross-linker comprises an organic peroxide or isocyanate-based cross-linker.

22. The composite board of claim 19 or 20, wherein the composite board comprises at least one of the following:

a) MoR greater than 1000MPa,
b) MoE greater than 8MPa,
c) IB greater than 0.2MPa,
d) moisture content of greater than about 5%, or
e) moisture content of less than about 15%.