Claims

1. A particulate porous material that comprises a crosslinked polymeric matrix including a first set of constitutional units formed from ethylene glycol dimethacrylate monomers

wherein:

the particulate porous material comprises a plurality of pores having a pore diameter of from 1.6 nm to 50 nm;

the particulate porous material has a porosity of at least 3% (v/v) and a single point total pore volume of at least 0.15 cm^3/g; and

wherein the crosslinked polymeric matrix is a homopolymer consisting of the first set of constitutional units or the crosslinked polymeric matrix is a copolymer consisting of the first set of constitutional units and up to 30 mol % of a second set of constitutional units formed from a hydrophilic monomer.

2. The particulate porous material according to Claim 1, wherein:

(a) the particulate porous material has a Brunauer-Emmett-Teller adsorption average pore size of from 3 to 15 nm, such as from 3.5 to 10 nm (e.g. 3.6 to 9.4 nm); and/or

(b) the particulate porous material has a porosity of at least 6% (v/v) and a single point total pore volume of at least 0.3 cm^3/g.

3. The particulate porous material according to Claim 1 or 2, wherein: (a) the hydrophilic monomer is selected from one or more of the group consisting of itaconic acid, 2-(trifluoromethyl)acrylic acid, and allylurea, and/or

(b) the second set of constitutional units are present in an amount of from 2 to 25 mol % of the crosslinked polymeric matrix.

4. The particulate porous material according to any one of the preceding claims, having a porosity of from 8 to 30% (v/v), such as from 10 to 28% (v/v) (e.g. from 14 to 24% (v/v)).

5. The particulate porous material according to any one of the preceding claims, having a single point total pore volume of from 0.36 to 0.85 cm^3/g, such as from 0.4 to 0.8 cm^3/g (e.g. from 0.45 to 0.75 cm^3/g).

6. The particulate porous material according to any one of the preceding claims, having a porosity of from 8 to 30% (v/v) and a single point total pore volume of from 0.36 to 0.85 cm^3/g;

optionally a porosity of from 10 to 28% (v/v) and a single point total pore volume of from 0.4 to 0.8 cm^3/g.

7. The particulate porous material according to any one of the preceding claims, wherein the particulate porous material comprises a plurality of pores having a pore diameter of from 1.6 nm to 10 nm.

8. The particulate porous material according to any one of the preceding claims, wherein the particulate porous material has a nitrogen adsorption isotherm that is Type II or Type IV.

9. The particulate porous material according to any one of the preceding claims, wherein the particulate porous material has a D50 of less than 200 µm.

10. The particulate porous material according to any one of the preceding claims, wherein the particulate porous material has a total protein binding capacity that is less than 0.2g/g.

11. A sorbent cartridge suitable for use in purification of a bodily fluid (e.g. a kidney dialysis treatment, such as a haemodialysis treatment, a peritoneal dialysis treatment or a hemoperfusion treatment), wherein the sorbent cartridge comprises the particulate porous material according to any one of the preceding claims.

12. The sorbent cartridge according to Claim 11, further comprising one or more of:
cation exchange particles (e.g. zirconium phosphate);
anion exchange particles (e.g. hydrous zirconium oxide);
activated carbon;
a buffer (e.g. calcium carbonate); and
a urease.

13. A method of performing dialysis (e.g. haemodialysis, peritoneal dialysis or hemoperfusion), comprising a step of passing a dialysate through a sorbent cartridge as defined in Claim 11 or 12.

14. Use of a particulate porous material as defined in any one of Claims 1 to 10, or a sorbent cartridge according to Claim 11 or 12, to adsorb beta-2 microglobulin.

15. A method of removing beta-2 microglobulin from a fluid, comprising:
providing a fluid comprising beta-2 microglobulin; and

exposing said fluid to a particulate porous material as defined in any one of Claims 1 to 10.

16. A method of preparing a particulate porous material as defined in any one of Claims 1 to 10, the method comprising the steps:

(i) providing mixture comprising a first monomer that is ethylene glycol dimethacrylate, an initiator, a porogen and optionally a second monomer that is a hydrophilic monomer;

(ii) conducting a polymerisation reaction to form a bulk porous material; and

(iii) grinding or pulverising the bulk porous material to provide a particulate porous material.

17. The method according to Claim 16, further comprising washing the particulate porous material to remove the porogen.

18. The method according to Claim 16 or 17, wherein one or both of the following apply:

(a) the porogen is an organic solvent selected from the group consisting of toluene, chloroform, acetone, dimethylformamide, dimethylsulfoxide, dioxane, ethyl acetate, and acetonitrile; and

(b) the porogen is an organic solvent having a Hansen distance (R_a) of up to 10 $MPa^{1/2}$, where $D_{polymer}$ = 17.0, $P_{polymer}$ = 9.7 and $H_{polymer}$ = 4.9; and

19. The method according to any one of Claims 16 to 18, wherein step (ii) is performed at a temperature of from 50°C to 70°C.