CLAIMS

1. A composition for removal of a poly- and perfluorinated alkyl substance (PFAS) from an aqueous liquid, the composition comprising:

a particulate support material comprising a bimodal alumina having pores within a mesoporous range and pores within a macroporous range;

(i) in which a majority of the pores within the mesoporous range have an average pore size of between 2 nm and 50 nm; and

(ii) in which the bimodal alumina has a BET pore volume within the mesoporous range of not less than around 0.20 cm^3/g; and

a sorbent molecule that comprises a linear or branched core polymer selected from one or more of: poly(ethylenimine); poly(allylamine); poly(methylmethacrylate); poly(vinylalcohol); poly(vinylamine); poly(vinylchloride); poly(2-vinylpyridine); poly(3-vinylpyridine); or poly(4-vinylpyridine);

in which the linear or branched core polymer is covalently linked to the particulate support material; and

in which the sorbent molecule further comprises one or more covalently linked sorbent groups.

2. A composition according to Claim 1, in which the alumina has an average pore size within the mesoporous range of between about 2 about 20 nm.

3. A composition according to Claim 1, in which a majority of the pores within the macroporous range have an average pore size of between 1 μm and 10 μm.

4. A composition according to Claim 1, in which the core polymer comprises a linear or branched poly(ethylenimine) having a weight average molecular weight of not less than around 25 kDa.

5. A composition according to Claim 1, in which the covalently linked sorbent groups comprise one or more groups selected from: a substituted or unsubstituted C1-C12 alkyl group; a substituted or unsubstituted C2-C12 alkenyl group; a substituted or unsubstituted C2-C12 alkynyl group; a substituted or unsubstituted C1-C12 alkoxy group; a substituted or

unsubstituted C1-C12 acyl group; a substituted or unsubstituted aromatic hydrocarbon group; a substituted or unsubstituted aromatic group; a heterocyclic group; and a hydrogen atom.

6. A composition according to Claim 1, in which the core polymer comprises at least one tertiary amino group and in which the at least one tertiary amino group is converted to a quaternary nitrogen.

7. A composition according to Claim 1, in which the core polymer comprises C1-C10 alkyl substituted linear poly(ethylenimine).

8. A composition according to Claim 1, in which the core polymer comprises C1-C6 alkyl substituted branched poly(ethylenimine).

9. A composition according to Claim 1, in which support material is in a form selected from granular; powder; and spheroidal particles.

10. A process for removal of a target substance from a fluid stream that comprises water, the process comprising contacting the fluid stream with a composition as defined in Claim 1, and in which the target substance comprises one or more poly- and perfluorinated alkyl substances (PFAS).

11. A process according to Claim 10, in which the PFAS is selected from a perfluorinated anionic surfactant compound, including one or more selected from the group consisting of: perfluorobutane sulfonate (PFBS); perfluorobutanoic acid (PFBA); perfluoropentanoic acid (PFPeA); perfluorohexanesulfonate (PFHS); perfluorohexanoic acid (PFHA); perfluorooctanoic acid (PFOA); perfluorooctane sulfonate (PFOS); perfluorononanoic acid (PFNA); and perfluorodecanoic acid (PFDA); 6:2 fluorotelomer sulfonic acid (6:2 FTSA); and hexafluoropropylene oxide dimer acid (HFPO-DA).

12. A process according to Claim 10, in which the linear or branched PEI has weight average molecular weight of not less than around 25 kDa.

13. A process according to Claim 12, in which the particulate alumina is in a form selected from: granular; powder; and spheroidal particles.

14. A process according to Claim 10, in which the support material is comprised within a packed bed.

15. A process according to Claim 14, in which the support material is comprised within a filter unit.

16. A filter for the adsorption of one or more PFAS from a contaminated water source, in which the filter comprises a composition as described in Claim 1.

17. A filter according to Claim 16, in which the filter is configured as a point-of-use (POU) filter.

18. A filter according to Claim 17, in which the filter is comprised within a replaceable cartridge.

19. A filter according to Claim 16, in which the filter is configured to be incorporated into a point-of-entry (POE) system.

20. A filter according to any of Claims 16 to 19, in which the composition is comprised within a packed bed that is configured to permit a minimum water flow rate there-through of at least 2 litres/min.