CLAIMS

What is claimed is:

1. A method of performing liquid chromatography, comprising:

contacting a mobile phase and a stationary phase within a column, wherein the stationary phase comprises a separation matrix comprising spheroidal polymer beads prepared by dispersing a hydrocolloid or other gel forming compound or a water-soluble polymerizable monomer through a plurality of holes in a membrane under conditions sufficient to form spheroidal polymer beads having a volume median particle diameter up to about 300 μm;

wherein the mobile phase linear flow velocity (cm/h) is increased when the spheroidal polymer beads have a particle size distribution spread (SPAN) of less than about 0.6 compared to spheroidal polymer beads having a SPAN of more than 0.6.

2. The method of claim 1, wherein the linear flow velocity (cm/h) of the mobile phase moving through the stationary phase in the liquid chromatography process is increased by the use of spheroidal polymer beads having a SPAN of less than about 0.6.

3. The method of claim 1 or 2, wherein the mobile phase flow pressure is between less than about 0.5 MPa, or from about 0.3 MPa to about 0.5 MPa.

4. The method of any one of claims 1-3, wherein the mobile phase linear flow velocity is increased with the use of the spheroidal polymer beads compared to polymer beads prepared by stirred reactor emulsification.

5. The method of any one of claims 1-3, wherein the increase in linear flow velocity is at least about 50 cm/hr, at least about 100 cm/hr, at least about 200 cm/hr, or at least about 250 cm/hr compared to the linear flow velocity using the same polymer beads prepared by stirred reactor emulsification.

6. The method of any one of claims 1-3, wherein the linear flow velocity is increased by at least about 10%, at least about 20%, at least about 30%, or at least about 40% compared to the linear flow velocity using the same polymer beads prepared by stirred reactor emulsification.

7. The method of any one of claims 1-6, wherein the spheroidal polymer beads have substantially uniform particle size as measured by a particle size distribution having a uniformity

coefficient of less than about 1.2 or a coefficient of variance of particle size distribution of less than about 20%.

8. The method of any one of claims 1-7, wherein spheroidal polymer beads have a SPAN of less than about 0.5, or preferably less than about 0.45, or preferably less than about 0.3.

9. The method of any one of claims 1-8, wherein the spheroidal polymer beads have a volume median particle diameter of about 5 μm to about 250 μm, or from about 20 to about 200 μm.

10. The method of any one of claims 1-9, wherein the spheroidal polymer beads have less size variability and impart less fluid flow resistance compared to the same polymer beads prepared by stirred reactor emulsification.

11. The method of any one of claims 1-10, wherein the hydrocolloid dispersed from the spheroidal polymer beads comprises a polysaccharide.

12. The method of claim 11, wherein the polysaccharide is a cross-linked polysaccharide.

13. The method of any one of claims 11-12, wherein the polysaccharide comprises agarose.

14. The method of any one of claims 1-13, wherein the increased mobile phase linear flow velocity does not interfere significantly with binding capacity or selectivity of a ligand binding to the spheroidal polymer beads.

15. A separation matrix for liquid chromatography, comprising:
a stationary phase housed within a column,
wherein the stationary phase comprises a separation matrix comprising spheroidal polymer beads prepared by dispersing a hydrocolloid or other gel forming compound or a water-soluble polymerizable monomer through a plurality of holes in a membrane under conditions sufficient to form spheroidal polymer beads having a volume average particle diameter up to about 300 μm and having a SPAN of less than about 0.6,
wherein the stationary phase permits a mobile phase to pass through the stationary phase in the column at an increased linear flow velocity (cm/h) compared to a stationary phase comprising spheroidal polymer beads having a SPAN greater than 0.6.

16. The separation matrix of claim 15, wherein the mobile phase flow pressure is between less than about 0.5 MPa, or from about 0.3 MPa to about 0.5 MPa.

17. The separation matrix of any one of claims 15-16, wherein the mobile phase linear flow velocity is increased with the use of the spheroidal polymer beads compared to polymer beads prepared by stirred reactor emulsification.

18. The separation matrix of any one of claims 15-17, wherein the increase in linear flow velocity is at least about 50 cm/hr, at least about 100 cm/hr, at least about 200 cm/hr, or at least about 250 cm/hr compared to the linear flow velocity using the same polymer beads prepared by stirred reactor emulsification.

19. The separation matrix of any one of claims 15-18, wherein the linear flow velocity is increased by at least about 10%, at least about 20%, at least about 30% or at least about 40% compared to the linear flow velocity using the same polymer beads prepared by stirred reactor emulsification.

20. The separation matrix of any one of claims 15-19, wherein spheroidal polymer beads have a particle size distribution spread (SPAN) less than about 0.5, or preferably less than about 0.45.

21. The separation matrix of any one of claims 15-20, wherein the spheroidal polymer beads have less size variability and impart less fluid flow resistance compared to the same polymer beads prepared by stirred reactor emulsification.

22. The separation matrix of any one of claims 15-21, wherein the hydrocolloid dispersed to from the spheroidal polymer beads comprises a polysaccharide, preferably agarose.

23. The separation matrix of any one of claims 15-22, wherein the increased mobile phase linear flow velocity does not interfere significantly with binding capacity or selectivity of a ligand binding to the spheroidal polymer beads.