CLAIMS

1. A method for preparing a magnetic chain structure, the method comprising
    a) providing a plurality of magnetic particles;
    b) dispersing the plurality of magnetic particles in a solution comprising a dopamine-based material to form a reaction mixture;
    c) applying a magnetic field across the reaction mixture to align the magnetic particles in the reaction mixture; and
    d) polymerizing the dopamine-based material on the aligned magnetic particles to obtain the magnetic chain structure.

2. The method according to claim 1, wherein the magnetic particle has a core-shell structure, the core comprising a magnetic material, and the shell comprising a material selected from the group consisting of a polymer, silica, a metal, a metal-organic framework, and combinations thereof, surrounding the core.

3. The method according to claim 1, wherein the magnetic particle comprises a magnetic material selected from the group consisting of a ferromagnetic material, a superparamagnetic material, and combinations thereof.

4. The method according to claim 1, wherein the magnetic particle comprises a superparamagnetic material.

5. The method according to claim 4, wherein the superparamagnetic material is selected from the group consisting of a superparamagnetic metal, a superparamagnetic metal oxide, a heterogeneous structure comprising a superparamagnetic metal and/or a superparamagnetic metal oxide, and combinations thereof.

6. The method according to claim 5, wherein the superparamagnetic metal is selected from the group consisting of Fe, Co, Ni, FeAu, FePt, FePd, CoPt, and alloys thereof.

7. The method according to claim 5, wherein the superparamagnetic metal oxide is selected from the group consisting of Fe_2O_3, Fe_3O_4, CoO, NiO, $CoFe_2O_4$, $MnFe_2O_4$, and combinations thereof.

8. The method according to claim 5, wherein the heterogeneous structure comprising a superparamagnetic metal and/or a superparamagnetic metal oxide is selected from the group consisting of Au-Fe_2O_3, Ag-Fe_3O_4, a quantum dot-Fe_2O_3 nanostructure, and combinations thereof.

9. The method according to claim 2, wherein the polymer is selected from the group consisting of polystyrene, polymethacrylate, phenol formaldehyde resin, copolymers thereof, and combinations thereof.

10. The method according to claim 1, wherein the magnetic particle has a core-shell structure, the core comprising Fe_3O_4 and the shell comprising polystyrene surrounding the core.

11. The method according to claim 1, wherein the solution has a pH in the range of about 7.1 to about 12.

12. The method according to claim 1, wherein the dopamine-based material is selected from the group consisting of dopamine, norepinephrine, L-3,4-dihydroxyphenylalanine, and combinations thereof.

13. The method according to claim 1, wherein concentration of the dopamine-based material in the reaction mixture is in the range of about 0.08 mg/ml to about 0.5 mg/ml.

14. The method according to claim 1, wherein amount of the magnetic particles in the reaction mixture is in the range of about 0.001 wt% to about 0.5 wt%.

15. The method according to claim 1, wherein applying a magnetic field across the reaction mixture is carried out in a reaction chamber comprising one or more channels having a width corresponding to a length of the magnetic chain structure.

16. The method according to claim 1, further comprising polymerizing the dopamine-based material on the magnetic particles prior to applying a magnetic field across the reaction mixture to align the magnetic particles in the reaction mixture.

17. The method according to claim 1, further comprising agitating the reaction mixture comprising the aligned magnetic particles prior to polymerizing the dopamine-based material on the aligned magnetic particles.

18. The method according to claim 1, further comprising dispersing the obtained magnetic chain structure in a second solution comprising a second dopamine-based material, and polymerizing the second dopamine-based material on the magnetic chain structure.

19. The method according to claim 1, further comprising attaching a moiety selected from the group consisting of a polymer, a metal nanoparticle, a metal oxide nanoparticle, a biomolecule, a metal-organic framework material, and combinations thereof, to the magnetic nanochain.