What is claimed is:

Claims

1. A soluble stimulus responsive polymer comprising a polyvinylaminepolyelectrolyte backbone comprising one or more hydrophobic groups attached to the backbone, wherein the polymer is capable of binding and precipitating a biomolecule of interest in a sample upon addition of a stimulus.

2. The soluble stimulus responsive polymer of claim 1, wherein the polyelectrolyte backbone comprises at least two monomeric units.

3. The soluble stimulus responsive polymer of claim 2, wherein the polyelectrolyte backbone comprises at least three monomeric units.

4. The soluble stimulus responsive polymer of claim 2, wherein each monomeric unit in the polyelectrolyte backbone comprises a charge.

5. The soluble stimulus responsive polymer of claim 2, wherein at least 50% of the monomeric units comprise a charge.

6. The soluble stimulus responsive polymer of claim 1, wherein the biomolecule of interest is a therapeutic polypeptide.

7. The soluble stimulus responsive polymer of claim 1, wherein the biomolecule of interest is an impurity present in a sample along with a therapeutic polypeptide.

8. The soluble stimulus responsive polymer of claim 7, wherein the impurity is selected from the group consisting of host cell protein, endotoxin, DNA, RNA, viruses, lipids, whole cells and cellular debris.

9. The soluble stimulus responsive polymer of claim 1, wherein the stimulus is a multivalent ion.

10. The soluble stimulus responsive polymer of claim 9, wherein the multivalent ion is phosphate or citrate.

11. The soluble stimulus responsive polymer of claim 7, wherein the therapeutic polypeptide is an antibody.

12. The soluble stimulus responsive polymer of claim 11, wherein the antibody is a monoclonal antibody.

~~13. A stimulus responsive polymer selected from the group consisting of polyallylamine, polyallylamine modified with a benzyl group, polyvinylamine and polyvinylamine modified with a benzyl group, wherein the stimulus is phosphate or citrate.~~

13.~~14.~~ A method of separating a target molecule from one or more impurities in a sample, wherein the method comprises the steps of:

(a) providing a sample comprising a target molecule and one or more impurities;

(b) contacting the sample with a soluble stimulus responsive polymer comprising a polyelectrolyte backbone comprising one or more hydrophobic groups attached to the backbone ~~according to claim 1~~ , thereby to form a complex of polymer and the one or more impurities; and

(c) adding a stimulus to the sample, thereby to precipitate the complex out of solution,

thereby to separate the target molecule from one or more impurities.

14.~~15.~~ The method of claim 13~~14~~, wherein the method further comprises one or more filtration steps.

15.~~16.~~ The method of claim 13~~14~~, wherein the method further comprises one or more chromatography step.

16.~~17.~~ The method of claim 13~~14~~, wherein the stimulus is a multivalent ion.

17.~~18.~~ The method of claim 16~~17~~, wherein the multivalent ion is phosphate or citrate.