L" is a divalent linking group comprising 2 or more carbons,
R" is a monovalent radical selected from the group consisting of hydrogen and alkyl groups comprising 1 to 6 carbons, and
W" is a monovalent end group comprising 1 to 10 carbons;
wherein
components a), b), and c) of the nanoparticle are bound at least by non-covalent interactions,
the nanoparticle is dispersible in water, and
the nanoparticle is capable of controlled release of the drug in a medical treatment.

[0007] The present disclosure provides a polycarbonate, comprising:
a first repeat unit comprising an aliphatic carbonate backbone portion and a side chain linked to the backbone portion, the side chain comprising an aromatic nitrogen-containing heterocycle (N-heterocycle), wherein the N-heterocycle is present in the first repeat unit as a free base (non-charged form), a hydrosalt of the free base, a sulfobetaine adduct of the free base, or a combination thereof.

[0008] The above-described and other features and advantages of the present invention will be appreciated and understood by those skilled in the art from the following detailed description, drawings, and appended claims.

Brief Description of Drawings

[0009] [fig. 1] Fig. 1 is bar chart showing the toxicity profile of sulfobetaine polymer S-1 to HEK293 cells. S-1 is not cytotoxic.
[fig. 2] Fig. 2 is bar chart showing the toxicity profile of sulfobetaine polymer S-2 to HEK293 cells. S-2 is not cytotoxic.
[fig. 3] Fig. 3 is bar chart showing the toxicity profile of sulfobetaine polymer S-3 to HEK293 cells. S-3 is not cytotoxic.
[fig. 4] Fig. 4 is bar chart showing the toxicity profile of poly(ethylene glycol), Mn 5000, (5K PEG) to HEK293 cells. The 5K PEG is not cytotoxic.
[fig. 5] Fig. 5 is bar chart showing the toxicity profile of poly(ethylene glycol), Mn 10000, (10K PEG) to HEK293 cells. The 10K PEG is not cytotoxic.
[fig. 6] Fig. 6 is a graph showing the particle size growth of S-1, S-2 and S-3 versus incubation time up to 48 hours using phosphate buffered saline (PBS) containing 10% serum. Polymer-protein aggregation was observed with S-3. No polymer-protein aggregation was observed with S-1 and S-2.
[fig. 7] Fig. 7 is a bar chart showing the drug loading content (wt%) of Examples 42 to 48.
[fig. 8] Fig. 8 is a graph comparing the drug release profile for the nanoparticles of Example 47 containing 19 wt% Doxorubicin (DOX) with DOX-loaded urea-acid

repeat unit is present as a sulfobetaine adduct.

[Claim 10] The nanoparticle of claim 1, wherein the first polycarbonate block is a homopolymer of the first repeat unit.

[Claim 11] The nanoparticle of claim 1, wherein the second polycarbonate block is a homopolymer of the second repeat unit.

[Claim 12] The nanoparticle of claim 1, wherein the first PEO block and the second PEO block independently have a degree of polymerization (DP) of about 80 to about 200.

[Claim 13] The nanoparticle of claim 1, wherein the nanoparticle has an average circular diameter of about 20 nm to about 700 nm.

[Claim 14] A method, comprising:

forming a first mixture comprising a drug and a water miscible organic solvent;

forming a second mixture by dissolving together in water a first block polymer and a second block polymer;

combining the first mixture and the second mixture, thereby forming a third mixture; and

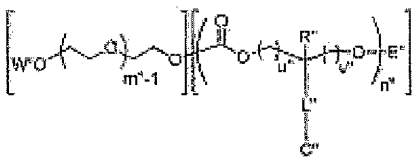
removing the organic solvent from the third mixture, thereby forming a water dispersible nanoparticle comprising the drug, the first block polymer, and the second block polymer bound at least by non-covalent interactions;

wherein

the first block polymer comprises i) a first poly(ethylene oxide) block (first PEO block) and ii) a first polycarbonate block linked to the first PEO block, wherein the first polycarbonate block comprises a first repeat unit, the first repeat unit comprises an aliphatic carbonate backbone portion and a side chain linked to the backbone portion, the side chain of the first repeat unit comprises an aromatic nitrogen-containing heterocycle (N-heterocycle), and the N-heterocycle has the form of a base, a hydrosalt of the base, a sulfobetaine adduct of the base, or a combination thereof,

the second block polymer comprises i) a second PEO block and ii) a second polycarbonate block linked to the second PEO block, wherein the second polycarbonate block comprises a second repeat unit comprising an aliphatic carbonate backbone portion and a side chain linked to the backbone portion, and the side chain of the second repeat unit comprises a catechol group, and

the nanoparticle is capable of controlled release of the drug in a



(d)

wherein
u" is a positive integer from 0 to 6,
v" is a positive integer from 0 to 6,
u" and v" cannot both be zero,
n" is a positive number of 2 to about 50,
m" is a positive number of about 80 to about 200,
E" is a monovalent end group selected from the group consisting of hydrogen and functional groups comprising 1 or more carbons,
C" is a moiety comprising a catechol group,
L" is a divalent linking group comprising 2 or more carbons,
R" is a monovalent radical selected from the group consisting of hydrogen and alkyl groups comprising 1 to 6 carbons, and
W" is a monovalent end group comprising 1 to 10 carbons;
wherein
components a), b), and c) of the nanoparticle are bound at least by non-covalent interactions,
the nanoparticle is dispersible in water, and
the nanoparticle is capable of controlled release of the drug in a medical treatment.