What is claimed is:

1. A medical article formed from a polyurethane-based resin, which is a reaction product of ingredients comprising:

a diisocyanate;

a diol chain extender;

a polyglycol; and

a zwitterionic modifier or a combination of anionic and cationic modifiers incorporated into a backbone, as a side chain, or both of the polyurethane-based resin formed by the diisocyanate, the polyglycol, and the diol chain extender, wherein the zwitterionic modifier comprises at least one anionic functional moiety and at least one cationic functional moiety, the anionic functional moiety comprises $–SO_3^-$, or a combination of $–COO^-$ and $–SO_3^-$, and the cationic functional moiety comprises quaternary ammonium, and wherein the anionic modifier comprises $–SO_3^-$, or a combination of $–COO^-$ and $–SO_3^-$, and the cationic modifier comprises quaternary ammonium;

the polyurethane-based resin having a hard segment content in a range of from 25% to 75% by weight and a soft segment content of the resin is in a range of from 75% to 25% by weight.

2. The medical article of claim 1, which is effective to reduce thrombus formation and/or bacterial biofilm formation.

3. The medical article of claim 1, wherein the anionic modifier comprises one or more of: bis-1,4-((2-hydroxypropoxy)-2-propoxy)-butane sulfonate sodium salt; 2,3-dihydroxypropane-1-sulfonate sodium salt; N,N-bis(2-hydroxyethyl)-2-aminoethanesulfonate sodium salt; 2,2-bis(hydroxymethyl)propionic acid; 2,2-bis(hydroxymethyl)butyric acid; or combination thereof.

4. The medical article of claim 1, wherein the cationic modifier comprises: bis(2-hydroxyethyl)dimethylammonium chloride.

5. The medical article of claim 1, wherein the zwitterionic modifier comprises: N,N-bis(2-hydroxyethyl)-2-amino-ethanesulfonic acid; N,N-bis(2-hydroxyethyl)glycine; or combination thereof.

6. The medical article of claim 1, wherein the ingredients of the reaction product consist essentially of:

4,4’-diphenylmethane diisocyanate (MDI) as the diisocyanate;

1,4-butanediol as the diol chain extender;

a polytetramethylene ether glycol as the polyglycol;

bis(2-hydroxyethyl)dimethylammonium chloride (BHDAC) as the cationic modifier; and

2,2-bis(hydroxymethyl)butyric acid (BHMBA) and/or bis-1,4-((2-hydroxypropoxy)-2-propoxy)-butane sulfonate sodium salt (SULFADIOL®-7Q) as the anionic modifier.

7. The medical article of claim 1, wherein the ionic modifier is present in an amount of greater than or equal to 0.01 weight percent of the overall composition of the polyurethane-based resin.

8. The medical article of claim 1, wherein the ionic modifier is present in an amount of less than or equal to 75 weight percent of the overall composition of the polyurethane-based resin.

9. The medical article of claim 1, wherein the diisocyanate is selected from the group consisting of: an aliphatic diisocyanate, alicyclic diisocyanate and an aromatic diisocyanate.

10. The medical article of claim 1, wherein the diisocyanate is selected from the group consisting of: 4,4’-diphenylmethane diisocyanate (MDI), toluene diisocyanate (TDI), isophorone diisocyanate (IPDI), methylene-bis(4-cyclohexylisocyanate) (HMDI), and combinations thereof.

11. The medical article of claim 1, wherein the diol chain extender is selected from the group consisting of: ethylene glycol, 1,3-propylene glycol, 1,4-butanediol, neopentyl glycol, and alicyclic glycols having up to 10 carbon atoms.

12. The medical article of claim 1, wherein the polyglycol is selected from the group consisting of: polyalkylene glycol, polyester glycol, polycarbonate glycol, and combinations thereof.

13. The medical article of claim 1, wherein the polyglycol comprises the polyalkylene glycol.

14. The medical article of claim 16, wherein the polyalkylene glycol comprises a polytetramethylene ether glycol.

15. The medical article of claim 1, wherein the polyurethane-based resin is bound to an ionic agent through ionic bonding, which is effective to actively provide enhanced surface properties including antimicrobial and/or anti-fouling activity.