CLAIMS

1. A wound dressing having a polymeric superporous hydrogel comprising:

a copolymer of poly(alkylvinylether/maleic acid), ~~a copolymer of poly(alkylvinylether/maleic anhydride),~~ or a copolymer of poly(styrene/maleic anhydride);

polyvinyl alcohol (PVA) or hydroxyethylcellulose (HEC); and

a plurality of pores.

2. The ~~polymeric superporous hydrogel~~wound dressing of claim 1, wherein the copolymer of ~~poly(alkylvinylether/maleic anhydride) is poly(methyl vinyl ether-*alt*-maleic anhydride) (PMVEMA).~~

~~3. The polymeric superporous hydrogel of claim 1, wherein the copolymer of~~ poly(alkylvinylether/maleic acid) is poly(methyl vinyl ether-*alt*-maleic acid) (PMVEMAC).

~~4~~3. The ~~polymeric superporous hydrogel~~wound dressing of claim 1, wherein the copolymer of poly(styrene/maleic anhydride) is poly(styrene-co-maleic anhydride) (SMA).

4.~~5.~~ The ~~polymeric superporous hydrogel~~wound dressing of claim 1, comprising polyvinyl alcohol (PVA).

5.~~6.~~ The ~~polymeric superporous hydrogel~~wound dressing of claim 1, wherein the average pore size of the plurality of pores ranges from ~~about~~ 5 µm to ~~about~~ l mm.

~~7.~~ 6. The ~~polymeric superporous hydrogel~~ wound dressing of claim 1, wherein the polymeric
superporous hydrogel exhibits a swelling ratio between ~~about~~ 4000% and ~~about~~ 8500% after 24 hours.

~~8~~7. The ~~polymeric superporous hydrogel~~wound dressing of claim 1, wherein the polymeric superporous hydrogel exhibits an elastic modulus (Young's modulus) between ~~about~~ $1x10^{-5}$ N/mm^2 and ~~about~~ $4x10^{-5}$ N/mm^2.

8.~~9.~~ The ~~polymeric superporous hydrogel~~wound dressing of claim 1, wherein the polymeric superporous hydrogel exhibits a tensile stress at break between ~~about~~ $0.3x10^{-5}$ N/mm^2 and ~~about~~ $1.3x10^{-4}$ N/mm^2.

9.~~10.~~ The ~~polymeric superporous hydrogel~~ wound dressing of claim 1, wherein the polymeric superporous hydrogel exhibits a maximum strength between ~~about~~ $3x10^{-2}$ N/mm and ~~about~~ $6.3x10^{-2}$ N/mm.

~~11.~~10. A method of making a wound dressing having a polymeric superporous hydrogel including a copolymer of poly(alkylvinylether/maleic acid~~), a copolymer of poly(alkylvinylether/maleic anhydride),~~) or a copolymer of poly(styrene/maleic anhydride), polyvinyl alcohol (PVA) or hydroxyethylcellulose (HEC), and a plurality of pores, the method comprising:

mixing an aqueous solution of a copolymer of poly(alkylvinylether/maleic acid), ~~a copolymer of poly(alkylvinylether/maleic anhydride),~~ or a copolymer of poly(styrene/maleic anhydride) with an aqueous solution of polyvinyl alcohol (PVA) or hydroxyethylcellulose (HEC);

adding a blowing agent to form gas bubbles; and

heating the resulting mixture at elevated pressure to form the polymeric superporous hydrogel.

~~12. The method of claim 11, wherein the copolymer of poly(alkylvinylether/maleic anhydride) is poly(methyl vinyl ether-*alt*-maleic anhydride) (PMVEMA).~~

~~13~~11. The method of claim ~~11~~10, wherein the copolymer of poly(alkylvinylether/maleic acid) is poly(methyl vinyl ether-*alt*-maleic acid) (PMVEMAC).

~~14~~12. The method of claim ~~11~~10, wherein the copolymer of poly(styrene/maleic anhydride) is poly(styrene-co-maleic anhydride) (SMA).

~~15~~13. The method of claim ~~11~~10, wherein one of the aqueous solutions ~~comprises~~ is polyvinyl alcohol (PVA).

~~16.~~14. The method of claim ~~11~~10, wherein the blowing agent is a carbonate.

~~17.~~15. The method of claim ~~16~~14, wherein the carbonate is sodium carbonate, sodium bicarbonate, potassium carbonate, potassium bicarbonate, calcium carbonate, calcium bicarbonate, or lithium carbonate.

16.~~18.~~ The method of claim ~~17~~15, wherein the carbonate is sodium bicarbonate.

17.~~19.~~ The method of claim ~~11~~10, wherein the blowing agent is a solid substance.

18.~~20.~~ The method of claim ~~11~~10, wherein the amount of the blowing agent is between ~~about~~ 0.1% w/v and ~~about~~ 1% w/v.

19.~~21.~~ The method of claim ~~11~~10, wherein heating the resulting mixture at elevated pressure is conducted for between ~~about~~ 30 min and ~~about~~ 2 hours.

20.~~22.~~ The method of claim ~~11~~10, wherein heating the resulting mixture is conducted at between ~~about~~ 110 °C and ~~about~~ 140 °C.

21.~~23.~~ The method of claim ~~11~~10, wherein the elevated pressure is between ~~about~~ 15 psi and ~~about~~ 40 psi.

22.~~24.~~ The method of claim ~~11~~10, wherein the method of making does not comprise the use of additional cross-linkers.

23.~~25.~~ The method of claim ~~11~~10, wherein the method of making does not comprise the use of initiators.

24.~~26.~~ The method of claim ~~11~~10, wherein the method of making does not comprise the use

of foam stabilizers.

25.~~27.~~ ~~The~~ The method of claim ~~11~~10, wherein the method of making does not comprise the use of organic solvents.

26.~~28.~~ ~~The~~ The method of claim ~~11~~10, wherein the method of making does not comprise any purification steps.

~~29.~~27. The method of claim ~~11~~10, wherein the average pore size in the polymeric superporous hydrogel ranges from ~~about~~ 5 µm to ~~about~~ 1 mm.

~~30.~~28. A method of making a wound dressing having polymeric superporous hydrogel including a copolymer of poly(alkylvinylether/maleic acid)~~, a copolymer of poly(alkylvinylether/maleic anhydride),~~ or a copolymer of poly(styrene/maleic anhydride), polyvinyl alcohol (PVA) or hydroxyethylcellulose (HEC), and a plurality of pores, the method comprising:

mixing an aqueous solution of a copolymer of poly(alkylvinylether/maleic acid) or a copolymer of poly(~~alkylvinylether~~styrene/maleic anhydride) with an aqueous solution of polyvinyl alcohol (PVA), hydroxyethylcellulose (HEC), or poly(acrylic acid) (PAA);

adding a blowing agent as a solid to form gas bubbles; and

heating the resulting mixture at elevated pressure to form the polymeric superporous hydrogel.

~~31. A wound dressing comprising a polymeric superporous hydrogel as claimed in claim 1.~~

~~32.~~29. The wound dressing of claim ~~31~~1, wherein the wound dressing further comprises an active agent.

~~33.~~30. The wound dressing of claim ~~32~~29, wherein the active agent is selected from an anti-inflammatory agent, an anesthetic, or a combination thereof.

~~34.~~31. The wound dressing of claim ~~33~~30, wherein the active agent is a topical corticosteroid.

~~35.~~32. The wound dressing of claim ~~34~~31, wherein the topical corticosteroid is hydrocortisone, clobetasone butyrate, or betamethasone dipropionate.

~~36.~~33. The wound dressing of claim ~~33~~30, wherein the active agent is lidocaine or benzocaine.

~~37.~~34. A polymeric superporous hydrogel obtained by the method of claim ~~11~~10.

~~38.~~35. A polymeric superporous hydrogel obtained by the method of claim ~~30~~28.

~~39. A method of treating Gram-positive bacteria at a site, the method comprising:~~

~~applying a polymeric superporous hydrogel as claimed in claim 1 to the site.~~

~~40. The method of claim 39, wherein applying the polymeric superporous hydrogel as claimed in claim 1 to the site includes applying a wound dressing incorporating the polymeric superporous hydrogel to the site.~~

~~41.~~36. ~~A method of use of~~ A~~a~~ polymeric superporous hydrogel as claimed in claim 34 or claim 35~~1~~ for use as an antimicrobial agent.