CLAIMS

1. A method for making a silica fiber composition, comprising:

preparing a sol that contains 70% to 90% tetraethyl orthosilicate (TEOS) by weight, 8% to 25% ethanol by weight, an acid catalyst, and the balance water;

transitioning the sol to a sol-gel for 2 to 7 days under conditions where humidity is within the range of 40% to 80%, and the temperature is within the range of 50 to 90° F; and

electrospinning the sol-gel into a silica fiber mat.

2. The method of claim 1, wherein the sol is not exposed to heat over 150° F.

3. The method of claim 2, wherein the sol is not exposed to heat over 100° F.

4. The method of claim 1, wherein the sol contains 75% to 85% by weight TEOS, 15% to 20% by weight ethanol, and 2% to 5% by weight water.

5. The method of claim 1, wherein the sol contains 70% to 90% by weight TEOS, 8% to 25% by weight ethanol, and 1% to 10% by weight water.

6. The method of claim 1, wherein the acid catalyst is HCl.

7. The method of claim 1, wherein the sol contains less than about 0.1% by weight of the acid catalyst.

8. The method of claim 7, wherein the sol contains from 0.02% to 0.08% by weight of the acid catalyst.

9. The method of claim 1, wherein the sol does not contain an organic polymer.

10. The method of claim 1, where the composition consists essentially of SiO_2.

11. The method of claim 1, wherein the sol is allowed to transition for 2 to 4 days.

12. The method of claim 11, wherein the sol is allowed to transition for about 3 days.

13. The method of claim 1, wherein the humidity is 50 to 70%.

14. The method of claim 13, wherein the temperature is 60 to 80° F.

15. The method of claim 1, wherein the conditions further comprise a fan exhausting gases from the sol.

16. The method of claim 1, wherein the sol-gel is electrospun when the weight is at from 20% to 40% of the starting weight of the sol.

17. The method of claim 1, wherein the sol-gel is electrospun when the production of ethylene vapor is 10% to 20% relative to the peak production of ethylene vapors from the sol.

18. The method of claim 1, wherein the mat has a thickness of at least about 1/8 inch.

19. The method of claim 18, wherein the mat has a thickness of at least about 1/4 inch.

20. The method of claim 1, further comprising combining at least a portion of the silica fiber mat with a liquid or gelatinous composition.

21. The method of claim 20, wherein the liquid or gelatinous composition comprises a paint, an epoxy, a urethane, or an adhesive.

22. The method of claim 20, wherein the at least a portion of the silica fiber mat is processed into a plurality of fragments or a powder for combination with the liquid or gelatinous composition, whereby a modified composition is formed.

23. The method of claim 22, further comprising applying the modified composition as a coating to a solid object or a fabric.

24. The method of claim 22, further comprising molding the modified composition into a solid object.

25. A silica fiber mat composition, comprising silica fibers prepared by electrospinning a sol-gel prepared with tetraethyl orthosilicate (TEOS), an alcohol solvent, and acid catalyst, the sol-gel having been allowed to transition for at least 2 days under conditions where humidity is within the range of about 40% to about 80%, and the temperature is within the range of 50º F to 90º F.

26. The composition of claim 25, wherein the sol-gel is electrospun when the weight is at from 20% to 40% of the starting weight before transitioning.

27. The composition of claim 25, wherein the sol-gel is electrospun when the production of ethylene vapor therefrom is 10% to 40% relative to the sol-gel before transitioning.

28. The composition of claim 25, wherein the fibers have a diameter of from about 50 nm to about 5 μm.

29. The composition of claim 25, wherein the fibers have a variable diameter of from about 200 nm to about 1000 nm.

30. The composition of claim 25, wherein the composition consists essentially of SiO_2.

31. The composition of claim 25, wherein the sol-gel is prepared with 70% to 90% TEOS by weight, 8% to 25% ethanol by weight, an acid catalyst, and the balance water.

32. The composition of claim 25, further comprising a topical carrier.

33. The composition of claim 32, wherein the topical carrier is a lotion, ointment, paste, cream, foam, or gel.

34. The composition of claim 32, wherein the topical carrier further comprises one or more pharmaceutical or antimicrobial agents.

35. The composition of claim 32, wherein the topical carrier comprises an antibiotic or antiseptic.

36. The composition of claim 32, wherein the topical carrier comprises an anti-inflammatory agent or immunosuppressant.

~~37. A method for improving integrity of injured tissue in a subject, the method comprising applying a silica fiber composition to said tissue without removing a substantial amount of the silica fiber composition from said tissue during and after healing of said tissue.~~

~~38. The method of claim 37, wherein the silica fiber composition is a permanent scaffold that supports tissue healing, regeneration, and/or integrity.~~

~~39. The method of claim 37, wherein the silica fiber composition is non-biodegradable.~~

~~40. The method of claim 37, wherein the silica fiber composition acts as a collagen replacement, and/or cell scaffold for wound healing.~~

41. The method of claim 37, wherein the silica fiber composition is prepared by electrospinning a sol-gel.

42. The method of claim 41, wherein the sol-gel is prepared with tetraethyl orthosilicate (TEOS).

43. The method of claim 41, wherein the sol-gel contains 70% to 90% TEOS by weight, 8% to 25% ethanol by weight, an acid catalyst, and the balance water.

44. The method of claim 41, wherein the sol-gel is allowed to transition for at least 2 days under conditions where humidity is within the range of about 40% to about 80%, and the temperature is within the range of 50º F to 90º F.

45. The method of claim 41, wherein the sol-gel is electrospun when the weight is at from 20% to 40% of the starting weight before ripening.

46. The method of claim 41, wherein the sol-gel is electrospun when the production of ethylene vapor is 10% to 20% relative to the peak production of ethylene vapors during ripening.

47. The method of claim 37, wherein fibers of the silica fiber composition have a variable diameter of from about 50 nm to about 5 µm.

48. The method of claim 37, wherein the silica fiber composition consists essentially of SiO_2.

49. The method of claim 37, wherein the silica fiber composition is applied to the tissue as a thin layer.

50. The method of claim 37, wherein the silica fiber composition is processed into a powder or dust, and the powder or dust is applied to the tissue.

~~51. The method of claim 50, wherein the powder or dust is mixed or suspended in a topical composition.~~

~~52. The method of claim 51, wherein the topical composition is a lotion, ointment, paste, cream, foam, or gel.~~

~~53. The method of claim 52, wherein the topical composition further comprises one or more pharmaceutical or antimicrobial agents.~~

~~54. The method of claim 53, wherein the topical composition comprises an antibiotic or antiseptic.~~

~~55. The method of claim 53, wherein the topical composition comprises an anti-inflammatory agent or immunosuppressant.~~

~~56. The method of claim 37, further comprising reapplying the silica fiber composition to the injured tissue once the silica fiber composition is no longer visible on the injured tissue.~~

~~57. The method of claim 37, wherein the injured tissue is not covered with any other wound dressing.~~

~~58. The method of claim 37, wherein the silica fiber composition prevents or reduces scarring of the tissue.~~

~~59. The method of claim 37, wherein the subject is a mammal.~~

~~60. The method of claim 59, wherein the subject is a human patient.~~

~~61. The method of claim 59, wherein the subject is a cat, dog, or horse.~~

~~62. The method of claim 37, wherein the tissue comprises skin.~~

~~63. The method of claim 37, wherein the silica fiber composition is applied to a skin lesion, ulcer, wound, burn, cut, scrape, or blister.~~

~~64. The method of claim 37, wherein the silica fiber composition is applied to a diabetic ulcer.~~

~~65. The method of claim 37, wherein the subject has a genetic blistering disease.~~

~~66. The method of claim 65, wherein the subject has epidermolysis bullosa.~~

~~67. The method of claim 37, wherein the silica fiber composition is applied to a pressure sore or pressure ulcer.~~

~~68. The method of claim 37, wherein the silica fiber composition is applied to a gangrenous wound or an amputation wound.~~

~~69. The method of claim 37, wherein the tissue has a wound comprising a skin burn, cut, or scrape, and the silica fiber composition is applied in layers in an amount that is sufficient to cover the wound.~~

~~70. The method of claim 69, further comprising reapplying the silica fiber composition to the injured tissue once the silica fiber composition is no longer visible on the injured tissue.~~

~~71. The method of claim 37, further comprising applying a wound dressing over the silica fiber composition.~~