WHAT IS CLAIMED IS:

1. A microneedle assembly comprising at least one microneedle extending outwardly from a support, wherein the microneedle includes a polymer composition containing a thermoplastic polymer having a melting temperature of 300°C or more, wherein the polymer composition exhibits a melt viscosity of about 100 Pa-s or less as determined in accordance with ISO Test No. 11443:2014 at a shear rate at a shear rate of 1,000 $seconds^{-1}$ and temperature of 30°C above the melting temperature, wherein a ratio of the deflection temperature under load as determined in accordance with ISO Test No. 75-2:2013 at a load of 1.8 Megapascals to the melting temperature is from 0.75 to 1, and further wherein the polymer composition exhibits a tensile elongation of 5% or less as determined at in accordance with ISO Test No. 527:2012 at a temperature of 23°C.

2. The microneedle assembly of claim 1, wherein the polymer composition exhibits a melt viscosity of 150 Pa.s or less as determined in accordance with ISO Test No. 11443:2014 at a shear rate at a shear rate of 400 $seconds^{-1}$ and temperature of 30°C above the melting temperature.

3. The microneedle assembly of claim 1, wherein the polymer composition exhibits a deflection temperature under load of 160°C or more as determined in accordance with ISO Test No. 75-2:2013 at a load of 1.8 Megapascals.

4. The microneedle assembly of claim 3, wherein the ratio of the deflection temperature under load to the melting temperature is from 0.75 to 0.95.

5. The microneedle assembly of claim 1, wherein the polymer composition exhibits a tensile modulus of 7,000 MPa or more as determined in accordance with ISO Test No. 527:2012 at a temperature of 23°C.

6. The microneedle assembly of claim 1, wherein the thermoplastic polymer includes a polyarylene sulfide, polyamide, polyaryleneketone, liquid crystalline polymer, or a combination thereof.

7. The microneedle assembly of claim 1, wherein the thermoplastic polymer includes a liquid crystalline polymer.

8. The microneedle assembly of claim 7, wherein the liquid crystalline polymer contains repeating units derived from one or more aromatic dicarboxylic acids, one or more aromatic hydroxycarboxylic acids, or a combination thereof.

9. The microneedle assembly of claim 8, wherein the aromatic hydroxycarboxylic acids include 4-hydroxybenzoic acid, 6-hydroxy-2-naphthoic acid, or a combination thereof.

10. The microneedle assembly of claim 8, wherein the aromatic hydroxycarboxylic acids include terephthalic acid, isophthalic acid, 2,6-naphthalenedicarboxylic acid, or a combination thereof.

11. The microneedle assembly of claim 8, wherein the liquid crystalline polymer further contains repeating units derived from one or more aromatic diols.

12. The microneedle assembly of claim 11, wherein the aromatic diols include hydroquinone, 4,4'-biphenol, or a combination thereof.

13. The microneedle assembly of claim 7, wherein the liquid crystalline polymer is wholly aromatic.

14. The microneedle assembly of claim 7, wherein the liquid crystalline polymer contains repeating units derived from naphthenic hydroxycarboxylic and/or dicarboxylic acids in an amount of 10 mol.% or more.

15. The microneedle assembly of claim 7, wherein the liquid crystalline polymer contains repeating units derived from 6-hydroxy-2-naphthoic acid in an amount of 30 mol.% or more.

16. The microneedle assembly of claim 1, wherein thermoplastic polymers constitute from 30 wt.% to 99 wt.% of the polymer composition.

17. The microneedle assembly of claim 1, wherein the polymer composition further comprises a mineral filler.

18. The microneedle assembly of claim 17, wherein the mineral filler is in the form of particles.

19. The microneedle assembly of claim 18, wherein the particles have a median size of 10 micrometers or less.

20. The microneedle assembly of claim 18, wherein the particles have a median size of from 0.6 to 2.5 micrometers.

21. The microneedle assembly of claim 18, wherein the particles include talc.

22. The microneedle assembly of claim 1, wherein the polymer composition further comprises a tribological additive material.

23. The microneedle assembly of claim 22, wherein the tribological additive material includes a fluoropolymer.

24. The microneedle assembly of claim 1, wherein the assembly includes a plurality of microneedles arranged in an array on the support.

25. The microneedle assembly of claim 1, wherein the microneedle has a tip and base.

26. The microneedle assembly of claim 25, wherein the tip has a length of from 5 to 500 nanometers and a width of from 0.5 to 5 micrometers.

27. The microneedle assembly of claim 25, wherein the base has a length of from 10 to 1,000 nanometers and a thickness of from 5 to 100 micrometers.

28. The microneedle assembly of claim 1, wherein the microneedle has a height of from 10 to 1,000 nanometers.

29. The microneedle assembly of claim 1, wherein the assembly is configured to deliver a drug compound.

30. The microneedle assembly of claim 29, wherein the drug compound includes a proteinaceous compound, polynucleotide agent, vaccine, small molecule agent, anti-infection agent, hormone, drug regulating cardiac action or blood flow, or a combination thereof.

31. The microneedle assembly of claim 29, wherein the drug compound has a molecular weight of 1 kDa or more.

32. The microneedle assembly of claim 29, wherein the drug compound includes a viral vaccine antigen.

33. The microneedle assembly of claim 32, wherein the vaccine antigen is a coronavirus vaccine antigen.

34. The microneedle assembly of claim 33, wherein the vaccine antigen is a viral vector, live attenuated virus, or an inactivated virus.

35. The microneedle assembly of claim 33, wherein the coronavirus vaccine antigen includes mRNA-1273, BNT162, Ad5-nCoV, ChAdOx1, bacTRL-Spike, BCG, AdCovid, NVX-CoV2373, LV-SMENP, SARS recombinant spike protein plus delta inulin, SARS VLPs S protein and influenza M1 protein, DNA vaccine VRC-SRSDNA015-00-VP, VEEV replicon particles expressing the SARS-CoV S, inactivated SARS-CoV-2 virus or viral vector, live attenuated SARS-CoV-2 virus, or a combination thereof.

36. The microneedle assembly of claim 32, wherein the viral vaccine antigen is derived from and/or used for prophylaxis against adenoviruses, arenaviruses, bunyaviruses, flavirviruses, hantaviruses, hepadnaviruses, herpesviruses, papilomaviruses, paramyxoviruses, parvoviruses, picornaviruses, poxviruses, orthomyxoviruses, retroviruses, reoviruses, rhabdoviruses, rotaviruses, spongiform viruses, togaviruses, or a combination thereof.

37. The microneedle assembly of claim 29, wherein the drug compound is coated onto a surface of the microneedle.

38. The microneedle assembly of claim 37, wherein the microneedle is solid.

39. The microneedle assembly of claim 29, wherein the microneedle contains at least one channel through which the drug compound is capable of flowing.

40. A transdermal delivery device comprising the microneedle assembly of claim 39 and a drug reservoir in fluid communication with the channel, wherein the drug compound is located within a reservoir.

41. The transdermal delivery device of claim 40, further comprising an additional reservoir containing an excipient.

42. A method for delivering a drug compound to a subject, the method comprising:

placing the transdermal delivery device of claim 1 adjacent to the skin of a subject;

penetrating a stratum corneum of the skin with the microneedle; and

transporting the drug compound from the microneedle and across the stratum corneum.

43. The method of claim 42, wherein the drug compound has a molecular weight of 1 kDa or more.

44. The method of claim 42, wherein the drug compound includes a viral vaccine antigen.

45. The method of claim 44, wherein the viral vaccine antigen includes a coronavirus vaccine antigen.

46. The method of claim 45, wherein the coronavirus vaccine antigen includes mRNA-1273, BNT162, Ad5-nCoV, ChAdOx1, bacTRL-Spike, BCG,

AdCovid, NVX-CoV2373, LV-SMENP, SARS recombinant spike protein plus delta inulin, SARS VLPs S protein and influenza M1 protein, DNA vaccine VRC-SRSDNA015-00-VP, VEEV replicon particles expressing the SARS-CoV S, inactivated SARS-CoV-2 virus or viral vector, live attenuated SARS-CoV-2 virus, or a combination thereof.

47. A method for detecting a target analyte in a subject, the method comprising:

placing the transdermal delivery device of claim 1 adjacent to the skin of a subject;

penetrating a stratum corneum of the skin with the microneedle so that the microneedle contacts a bodily fluid of the subject; and

detecting the presence of the analyte within the bodily fluid.

48. The method of claim 47, wherein the bodily fluid is blood.

49. The method of claim 47, wherein the analyte is detected on a surface of the microneedle.

50. The method of claim 49, wherein the microneedle is solid.

51. The method of claim 47, wherein the analyte is glucose.

52. The method of claim 47, wherein the bodily fluid is withdrawn from the subject through the microneedle.