WHAT IS CLAIMED IS:

1. A method of preparing a porous silicon film, wherein the method comprises:

etching a silicon material,

wherein the etching comprises exposure of the silicon material to an electric current density, and

wherein the etching produces a porous silicon film over a silicon substrate; and

gradually increasing the electric current density in sequential increments,

wherein the gradual increase of the electric current density comprises an increase of the electric current density by about 0.5-2 mA/cm^2 per sequential increment, and

wherein the gradual increase of the electric current density causes separation ~~separating~~ of the porous silicon film from the silicon substrate~~,~~

~~wherein the separating comprises a gradual increase of the electric current density in sequential increments~~.

2. The method of claim 1, wherein the silicon material comprises a silicon wafer.

3. The method of claim 1, wherein the etching of the silicon material further comprises use of an acid.

4. The method of claim 3, wherein the acid comprises hydrofluoric acid.

5. The method of claim 1, wherein the gradual increase of the electric current density during the separating step ~~comprises an increase of the electric current density by about 1-2 mA/cm^2 per sequential increment~~ does not exceed a maximum electric current density of about 20 mA/cm^2.

6. The method of claim 1 ~~5~~, wherein the gradual increase of the electric current density ~~during the~~

~~separating step~~ comprises an increase of the electric current density by about 1-2 mA/cm^2 per sequential increment for at least 5 to 10 increments.

7. The method of claim 1, wherein the formed porous silicon film comprises a plurality of pores, wherein the plurality of pores comprise diameters between about 1 nanometers to about 5 micrometers.

8. The method of claim 7, wherein the plurality of pores comprise diameters between about 500 nanometers to about 3 micrometers.

9. The method of claim 1, wherein the formed porous silicon film has a thickness ranging from about 10 micrometers to about 200 micrometers.

10. The method of claim 1, wherein the formed porous silicon film comprises pores that span at least 50% of a thickness of the porous silicon film.

11. The method of claim 1, wherein the formed porous silicon film comprises pores that span an entire thickness of the porous silicon film.

12. The method of claim 1, further comprising a step of associating the porous silicon film with a binding material.

13. The method of claim 12, wherein the binding material is selected from the group consisting of binders, carbon materials, polymers, metals, additives, and combinations thereof.

14. The method of claim 12, wherein the binding material comprises a polymer.

15. The method of claim 14, wherein the polymer is selected from the group consisting of

polyacrylonitrile (PAN), polyvinylidene difluoride (PVDF), polyacrylic acid (PAA), carboxymethyl cellulose (CMC), and combinations thereof.

16. The method of claim 12, wherein the binding material is carbonized.

17. The method of claim 12, wherein the binding material comprises a carbonized polyacrylonitrile.

18. The method of claim 1, further comprising a step of splitting the porous silicon film into particles.

19. The method of claim 18, wherein the splitting forms particles comprising diameters from about 1 μm to about 50 μm.

20. The method of claim 18, wherein the splitting occurs by at least one of physical grinding, crushing, sonication, ultrasonic fracture, pulverization, ultrasonic pulverization, and combinations thereof.

21. A method of preparing porous silicon particles, wherein the method comprises:

etching a silicon material,

wherein the etching comprises exposure of the silicon material to an electric current density, and

wherein the etching produces a porous silicon film over a silicon substrate;

gradually increasing the electric current density in sequential increments,

wherein the gradual increase of the electric current density comprises an increase of the electric current density by about 0.5-2 mA/cm^2 per sequential increment, and

wherein the gradual increase of the electric current density causes separation ~~separating~~ of the porous silicon film from the silicon substrate~~, wherein the separating comprises a gradual increase of the electric current density in sequential increments~~; and

splitting the porous silicon film into particles.

22. The method of claim 21, wherein the silicon material comprises a silicon wafer.

23. The method of claim 21, wherein the etching comprises use of hydrofluoric acid.

24. The method of claim 21, wherein the gradual increase of the electric current density ~~during the separating step~~ comprises an increase of the electric current density by about 1-2 mA/cm^2 per sequential increment for at least 5 to 10 increments.

25. The method of claim 21, further comprising a step of associating the porous silicon particle with a binding material.

26. The method of claim 25, wherein the binding material is selected from the group consisting of binders, carbon materials, polymers, metals, additives, and combinations thereof.

27. The method of claim 25, wherein the binding material comprises a polymer.

28. The method of claim 27, wherein the polymer is selected from the group consisting of polyacrylonitrile (PAN), polyvinylidene difluoride (PVDF), polyacrylic acid (PAA), carboxymethyl cellulose (CMC), and combinations thereof.

29. The method of claim 25, wherein the binding material is carbonized.

30. The method of claim 25, wherein the binding material comprises a carbonized polyacrylonitrile.