Claims

What is claimed is:

1. A method comprising:

screen-printing an ink pattern onto a major surface of a master tool, the ink pattern comprising a plurality of ink pattern elements extending away from the major surface and one or more indentations formed between the respective ink pattern elements that are adjacent to each other; and

applying a stamp-making material to the major surface of the master tool to form an elastomeric stamp having a stamping pattern, the stamping pattern being negative to the ink pattern of the master tool, the stamping pattern comprising a base surface and one or more stamping pattern elements extending away from the base surface, the stamping pattern elements corresponding to the indentations of the master tool, and each of the stamping pattern elements having a stamping surface.

2. The method of claim 1, wherein at least one of the ink pattern elements has a relief height of at least 10 micrometers.

3. The method of any preceding claim, wherein at least one of the ink pattern elements has a lateral dimension of at least 30 micrometers.

4. The method of any preceding claim, wherein at least one of the ink pattern elements has a draft angle of 0 to 10 degrees.

5. The method of any preceding claim, wherein screen-printing the ink pattern further comprises providing a screen having a screen pattern thereon, the screen pattern comprising open areas configured to allow fluid to pass through the screen, positioning the screen adjacent to the major surface of the master tool, and applying ink to pass through the open areas of the screen to form an ink pattern on the major surface of the master tool.

6. The method of claim 5, wherein providing the screen further comprises providing a photosensitive emulsion layer on the screen, and exposing the photosensitive emulsion layer via a photomask to develop the screen pattern thereon.

7. The method of claim 6, wherein the photosensitive emulsion layer comprises a photosensitive material including polyvinylacetate, poly vinyl alcohol, acrylate monomer, or a combination thereof.

8. The method of any preceding claim, wherein the stamp-making material includes uncured polydimethylsiloxane (PDMS).

9. The method of any preceding claim, wherein the master tool comprises a glass substrate.

10. The method of any preceding claim, wherein at least one of the stamping surfaces has a lateral dimension of at least 30 micrometers.

11. The method of any preceding claim, wherein at least one of the stamping pattern elements has a characteristic height of at least 10 micrometers.

12. An elastomeric stamp, produced by the method of any preceding claim.

13. A method of forming an electrically conductive pattern on a substrate, comprising:

providing a master tool having an ink pattern on a major surface of a master substrate thereof, the ink pattern comprising a plurality of ink pattern elements extending away from the major surface and one or more indentations formed between the respective ink pattern elements that are adjacent to each other;

applying a stamp-making material to the major surface of the master tool to form an elastomeric stamp having a stamping pattern, the stamping pattern being negative to the ink pattern of the master tool, the stamping pattern comprising a base surface and one or more stamping pattern elements extending away from the base surface, the stamping pattern elements corresponding to the indentations of the master tool, and each of the stamping pattern elements having a stamping surface;

inking the stamping surfaces of the stamp with an ink composition;

contacting the stamping surfaces of the stamp with the metalized surface of the substrate to transfer the ink composition from the stamping surfaces of the stamp to the metalized surface and create a printed pattern thereon; and

etching, using the printed pattern as an etching mask, the metalized surface to form one or more electrically conductive traces on the substrate.

14. The method of claim 13, wherein providing the master tool further comprises providing a screen having a screen pattern with open areas thereon, applying ink to pass through the open areas of the screen to form the ink pattern on the major surface of a master substrate, and drying the ink pattern to form the master tool.

15. The method of claim 13 or 14, wherein at least one of the stamping pattern elements has a characteristic height of at least 10 micrometers.

16. The method of any one of claims 13-15, wherein at least one of the stamping surfaces has a lateral dimension of at least 30 micrometers.

17. The method of any one of claims 13-16, wherein at least one of the electrically conductive traces has a lateral dimension of at least 30 micrometers.

18. The method of any one of claims 13-17, wherein the master tool comprises a glass substrate.

19. The method of any one of claims 13-18, wherein the stamp-making material includes uncured polydimethylsiloxane (PDMS).

20. The method of any one of claims 13-19, wherein the ink composition comprises a functionalizing molecule, wherein the functionalizing molecule comprises a functional group capable of binding to the metalized surface of the substrate.

21. The method of any one of claims 13-20, wherein the substrate includes a polymeric film and a metal layer disposed on the polymeric film.

22. The method of claim 21, wherein the polymeric film comprises poly(ethylene terephthalate) (PET), poly(butylenes terephthalate) (PBT), poly(ethylerne naphthalate) (PEN), or a combination thereof.

23. The method of claim 21 or 22, wherein the metal layer includes at least one of copper, silver, aluminum, gold, and combinations thereof.

24. An electrically conductive pattern on a substrate, formed by the method of any one of claims 13-23.

25. A glucose test strip comprising the electrically conductive pattern of claim 24.