which reduces process down time previously devoted to charging the stamps with an ink composition.

[0006] In one embodiment, the present disclosure is directed to a system, including a moving web of material unwound from a support; ~~a~~ an elastomeric stamp comprising an elastomeric material mounted on a print roller, wherein the stamp includes a ~~base~~ stamping surface ~~and~~ comprising a continuous, regular array of pattern elements having a trapezoidal cross-sectional shape and extending above the base surface, further wherein each pattern element on the stamp have a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein ~~the stamping~~ each pattern element~~s each have~~ has a substantially planar stamping surface; and ~~an~~ a re-inking roller with ~~a~~ an inking surface that at least periodicially contacts the stamping surface of the stamping elements to periodically or continuously provide ink to the stamping surface. The inking surface is impregnated with an ink composition including an organosulfur compound having a thiol functional group selected to bind to a major surface of the web material to form a self-assembled monolayer (SAM) thereon according to the array of pattern elements on the stamping surface.

[0007] In another embodiment, the present disclosure is directed to a system including a moving web of material unwound from a roller; an elastomeric stamp comprising an elastomeric material attached to a print roller, wherein the stamp has a stamping surface in contact with a major surface of the web of material, the stamping surface comprising a continuous, regular array of pattern elements, wherein each pattern element has a trapezoidal cross-sectional shape and extends above a base surface of the stamp, further wherein each pattern element on the stamp has a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein each pattern element has a substantially planar stamping surface; and an apparatus for inking the stamping surface with an ink composition including an organosulfur compound and an organic solvent. The apparatus for inking includes a re-inking roller with an inking surface impregnated with the ink composition, and the inking surface at least periodically contacts the stamping surface of the stamp to periodically or continuously provide ink to the stamping surface.

[0008] In another embodiment, the present disclosure is directed to a method including unwinding a web material from a support; providing an elastomeric stamp impregnated with an ink composition with a functionalizing molecule, wherein the functionalizing molecule includes a functional group selected to bind to said ~~substrate~~ web material, further wherein the elastomeric stamp comprises a stamping surface comprising a plurality of pattern elements, wherein each pattern element has a trapezoidal cross-sectional shape and extends above a base surface of the elastomeric stamp, further wherein each pattern element has a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein each pattern element has a substantially planar stamping surface; contacting ~~a~~ the stamping surface of the stamp with a major surface of the web material for a print time sufficient to bind the functional group with the web material to form a self-assembled monolayer (SAM) of the functionalizing material on the major surface of the web material according to an arrangement of pattern elements on the stamping surface; and contacting the stamping surface of the stamp at least periodically with a re-inking roller to periodically or continuously provide the ink composition to the stamping surface, wherein the re-inking roller includes an inking surface impregnated with the ink composition.

[0009] The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

CLAIMS:

1. A system, comprising:

a moving web of material unwound from a support;

~~a~~ an elastomeric stamp comprising an elastomeric material mounted on a print roller, wherein the stamp comprises a ~~base~~ stamping surface ~~and~~ comprising a continuous, regular array of pattern elements having a trapezoidal cross-sectional shape and extending above the base surface, further wherein each pattern element on the stamp have a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein ~~the stamping~~each pattern element~~s each comprise~~ has a substantially planar stamping surface; and

~~an~~ a re-inking roller comprising ~~a~~ an inking surface that at least periodicially contacts the stamping surface of the stamping elements to periodically or continuously provide ink to the stamping surface, wherein the inking surface is impregnated with an ink composition comprising an organosulfur compound having a thiol functional group selected to bind to a major surface of the web material to form a self-assembled monolayer (SAM) thereon according to the array of pattern elements on the stamping surface.

2. The system of claim 1, wherein the ~~pattern elements on the stamp comprise a substantially planar stamping surface with a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, and wherein an~~ aspect ratio ~~of a height of the pattern elements to the lateral dimension of the pattern elements~~ is ~~about~~ 1.5 to about 5.0.

3. The system of claim 1, further comprising an adhesive layer between the print roller and the stamp.

4. The system of claim ~~1~~3, further comprising a layer of an elastomeric material between the adhesive layer and the stamp.

5. The system of claim 1, wherein the stamp is mounted on an air supported sleeve.

6. The system of claim 1, wherein the inking surface comprises an elastomeric polymer.

7. The system of claim 6, wherein the elastomeric polymer comprises a poly(dimethysiloxane).

8. The system of claim 1, wherein the print roller is continuously fed with the ink composition.

9. The system of claim 1, wherein the re-inking roller is continuously fed with the ink composition from a fluid coupling within the re-inking roller.

10. A system, comprising:

a moving web of material unwound from a roller;

an elastomeric stamp comprising an elastomeric material attached to a print roller, wherein the stamp comprises a stamping surface in contact with a major surface of the web of material, the stamping surface comprising a continuous, regular array of pattern elements, wherein each pattern element has a trapezoidal cross-sectional shape and extends above a base surface of the stamp, further wherein each pattern element on the stamp has a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein each pattern element has a substantially planar stamping surface; and

an apparatus for inking the stamping surface with an ink composition comprising an organosulfur compound and an organic solvent, wherein the apparatus for inking comprises a re-inking roller with an inking surface impregnated with the ink composition, and wherein the inking surface at least periodically contacts the stamping surface of the stamp to periodically or continuously provide ink to the stamping surface.

11. The system of claim 10, wherein the inking surface of the re-inking roller comprises an elastomeric polymer.

12. The system of claim 11, wherein the elastomeric polymer comprises a poly(dimethysiloxane).

13. The system of claim 10, wherein the re-inking roller is continuously fed with the ink composition.

14. The system of claim 13, wherein the re-inking roller is continuously fed with ink from a fluid coupling within the re-inking roller.

15. The system of claim 10, wherein the web of material is tensioned between a first roller and a second roller.

16. A method comprising:

unwinding a web material from a support;

providing an elastomeric stamp impregnated with an ink composition comprising a functionalizing molecule, wherein the functionalizing molecule comprises a functional group selected to bind to said ~~substrate~~ web material, further wherein the elastomeric stamp comprises a stamping surface comprising a plurality of pattern elements, wherein each pattern element has a trapezoidal cross-sectional shape and extends above a base surface of the elastomeric stamp, further wherein each pattern element has a lateral dimension of about 0.25 microns to about 5 microns and a height with respect to the base surface, additionally wherein an aspect ratio of the height of the pattern elements to the lateral dimension of the pattern elements is at least 1.5, and further wherein each pattern element has a substantially planar stamping surface;

contacting ~~a~~ the stamping surface of the stamp with a major surface of the web material for a print time sufficient to bind the functional group with the web material to form a self-assembled

monolayer (SAM) of the functionalizing material on the major surface of the web material according to an arrangement of pattern elements on the stamping surface; and

contacting the stamping surface of the stamp at least periodically with a re-inking roller to periodically or continuously provide the ink composition to the stamping surface, wherein the re-inking roller comprises an inking surface impregnated with the ink composition.

17. The method of claim 16, further comprising removing the stamping surface from the major surface of the web material.

18. The method of claim 16, wherein ~~the stamp comprises a base surface and an arrangement of pattern elements extending away from the base surface, wherein the pattern elements comprise a stamping surface with a lateral dimension of less than about 5 microns and a height with respect to the base surface, and wherein an~~ aspect ratio ~~of a height of the pattern elements to the lateral dimension of the pattern elements~~ is ~~at least~~ 1.5 to about 5.0.

19. The method of claim 16, wherein the web material moves at a speed of at least about 10 feet per minute.

20. The method of claim 16, wherein the stamping surface comprises pattern elements with a lateral dimension of about 1 micron to about 5 microns.

~~21. The method of claim 16, wherein the pattern elements have a trapezoidal cross-sectional shape.~~

~~22~~21. The method of claim 16, wherein the print time is less than about 10 seconds.

~~23~~22. The method of claim 16, wherein the thickness of the SAM on a surface of the web material is less than about 50 Å.

~~24~~23. The method of claim 16, wherein the stamping surface comprises a poly(dimethylsiloxane).

~~25~~24. The method of claim 16, wherein the functionalizing molecule is an organosulfur compound.

~~26~~25. The method of claim ~~25~~24, wherein the organosulfur compound is selected from at least one of alkyl thiols and aryl thiols.

~~27~~26. The method of claim 16, wherein the major surface of the web material is a metal.

~~28~~27. The method of claim ~~27~~26, wherein the metal is silver.

~~29~~28. The method of claim 16, wherein the pattern elements form a regular and continuous array on the base surface of the stamp.

~~30~~29. The method of claim 16, wherein the stamping surface ~~is substantially flat and~~ comprises a regular array of the pattern elements, wherein the pattern elements are separated by grooves~~, and the pattern elements have a trapezoidal cross-sectional shape~~.

~~31~~30. The method of claim 16, wherein the web material is tensioned between a first support and a second support, and wherein the tension in the web material between the first support and the second support is at least 10 pounds per lineal inch.

~~32~~31. The method of claim 17, wherein the surface of the web material comprises SAM-free areas, and the method further comprises etching the SAM-free areas.

~~33~~32. The method of claim 16, wherein the stamp is mounted on a print roller.

~~34~~33. The method of claim ~~33~~32, further comprising a layer of a foam material between the print roller and the stamp.