Claims

1. An electrical contact comprising:

(a) a top electrode comprising a non-Newtonian liquid metal alloy; and

(b) a bottom electrode comprising a ~~soft material layer~~ self-assembled monolayer of molecules (SAM) formed on a metal substrate,

wherein the surface of the ~~soft material~~ SAM layer of the bottom electrode contacting the top electrode is a ~~smooth flat~~ template-stripped non-patterned surface~~.~~ and the electrical contact has no edge effect;

and the surface of the liquid metal alloy contacting the SAM layer is contained in a polymer insulator and the area of the electrical contact between the liquid metal alloy surface and the SAM layer is determined by modulating the diameter of the liquid metal alloy surface contacting the SAM layer, the diameter being between 15 µm to 55 µm.

~~2. The electrical contact according to claim 1, wherein the metal alloy is formed in a polymer insulator and the area of the electrical contact between the metal alloy and the soft material layer is determined by modulating the size of the metal alloy contacting the soft material layer.~~

~~3. The electrical contact according to claim 2, wherein the size of the metal alloy contacting the soft material layer is a diameter between 15 µm to 55 µm.~~

~~4.~~2. The electrical contact according to claim 1, wherein the non-Newtonian liquid metal alloy is EGaIn.

~~5.~~3. The electrical contact according to claim ~~4~~ 2, wherein the EGaIn ~~comprising~~ contains 75.5 wt% Ga and 24.5 wt% In.

~~6.~~4. The electrical contact according to claim ~~2~~ 1, wherein the polymer insulator is PDMS.

~~7.~~5. The electrical contact according to claim ~~6~~ 4, wherein the PDMS is transparent.

~~8.~~6. The electrical contact according to claim 1, wherein the metal ~~in~~ of the metal substrate is ~~any one~~ selected from the group~~:~~ consisting of silver, copper, nickel, platinum, palladium, and gold.

~~9.~~7. The electrical contact according to claim 1, wherein the ~~soft material~~ SAM layer is ~~purified~~ formed from a material of 99.9% purity.

~~10.~~8. The electrical contact according to claim 1, wherein the SAM layer has a thickness of ~~the soft material layer is between~~ 1nm to 2nm.

~~11. The electrical contact according to claim 1, wherein the soft material layer is a self-assembled monolayer of molecules (SAM).~~

~~12.~~9. The electrical contact according to claim ~~11~~ 1, wherein the SAM layer is formed of molecules of formula $S(CH_2)_{n-1}CH_3$, ~~where~~ n = being 10, 12, 14, 16 or 18.

~~13.~~10. A method for forming ~~an~~ the electrical contact of claim 1, the method comprising:

(a) providing ~~a top electrode,~~ the top electrode comprising ~~a~~ the non-Newtonian liquid metal alloy;

(b) preparing ~~a~~ the bottom electrode by forming ~~a~~ the self-assembled monolayer of molecules (SAM) on a metal substrate; and

(c) contacting the liquid metal alloy of the top electrode with the surface of the SAM layer of the bottom electrode~~.~~,

~~wherein the surface of the SAM layer is a smooth flat non-patterned surface.~~

~~14. The method according to claim 13, further comprising forming the metal alloy in a polymer insulator and modulating the size of the metal alloy contacting the SAM layer to determine and control the area of the electrical contact between the metal alloy and the SAM layer.~~

~~15. The method according to claim 13, wherein the size of the metal alloy contacting the SAM layer is a diameter between 15 µm to 55 µm.~~

~~16.~~11. The method according to claim ~~13~~ 10, wherein the non-Newtonian liquid metal alloy is EGaIn.

~~17.~~12. The method according to claim ~~16~~ 11, wherein the EGaIn ~~comprising~~ contains 75.5 wt% Ga and 24.5 wt% In.

~~18.~~13. The method according to claim ~~13~~ 10, wherein polymer insulator is PDMS.

~~19.~~14. The method according to claim ~~18~~ 13, wherein the PDMS is transparent.

~~20. The method according to claim 13, wherein the metal in the metal substrate is any one selected from the group: silver, copper, nickel, platinum, palladium and gold..~~

~~21. The method according to claim 13, wherein the SAM layer has the formula $S(CH_2)_{n-1}CH_3$ where n = 10, 12, 14, 16 or 18.~~

15. An electrical contact comprising:
a top electrode comprising a non-Newtonian liquid metal alloy; and
a bottom electrode comprising a self-assembled monolayer of molecules (SAM) formed on a metal substrate,
wherein the surface of the SAM layer of the bottom electrode contacting the top electrode is a template-stripped non-patterned surface and the electrical contact has no edge effect;
and the surface of the liquid metal alloy contacting the SAM layer is contained in a polymer insulator and the area of the electrical contact between the liquid metal alloy surface and the SAM layer is determined by modulating the diameter of the liquid metal alloy surface contacting the SAM layer, the diameter being between 15 µm to 55 µm; and the top electrode is prepared by stabilizing the non-Newtonian liquid metal alloy in a microfluidic device.