

We claim:

1. A method of producing microneedles, comprising the steps of;

The step of providing a container (600) having photopolymer (500),

5 **The step of providing a microlens (105) comprising light gathering and/or**
scattering transparent spheres (200) are arranged within the microlens container (100)
with elevated boundary rising from the base plane,

The step of loading a medium (300) into the microlens container (100) to adjust
the focal length of incident light beam at a specific wavelength projected onto the
photopolymer (500),

10 **The step of placing a substrate sheet (400) on top the container (600) wherein**
the substrate sheet (400) having the microlens (105) on top of the substrate sheet (400)
and

The step of fabricating microneedles (700) by photopolymerization induced
light guided through microlens (105), including the step of close-packed arranging the
15 light gathering and/or scattering transparent spheres (200) whose refractive index is
higher than that of the medium (300) with the refractive index ratio of the light gathering
and/or scattering transparent sphere (200) to the medium (300) between 1.0 and 1.5.

2. The method of producing microneedles of claim 1, wherein the light gathering and/or
scattering transparent spheres (200) are close-packed arranged with more than 1 layer
20 where size of the light gathering and/or scattering transparent sphere (200) in the above
layer is not larger than the size of those in the layer underneath.

3. The method of producing microneedles of claim 2, wherein a set of the light gathering
and/or scattering transparent sphere (200) close-packing assemble in the elevated
boundary as the first layer with another set of the light gathering and/or scattering
25 transparent sphere (200) positioned in some of or all voids between the close-packing
spheres (200) of the first layer.

4. A method of producing microneedles of the claims 1, wherein refractive index of the light
gathering and/or scattering transparent sphere (200) is larger than 1 and the diameter of
the light gathering and/or scattering transparent sphere (200) is in the range between 100
30 to 5000 μm .

5. The method of producing microneedles of the claims 1, wherein the medium (300) is
selected from transparent liquid and solid.

6. The method of producing microneedles of the claims 1, wherein the medium (300) is selected from ethylene glycol and polydimethylsiloxane.
7. The method of producing microneedles of claim 1, wherein the step of placing the substrate sheet (400) carried out varying the spacing between the microlens (105) and the substrate sheet (400) for controlling the microneedles (700) height.
8. The method of producing microneedles of claim 1, wherein the step of providing a microlens (105) carried out setting arrangement formation of the light gathering and/or scattering transparent spheres (200) for controlling the structure, pattern, and shape of the microneedles (700).
9. The method of producing microneedles of claim 1, wherein the step of fabricating microneedles (700) by photopolymerization carried out light exposure time for controlling the microneedles (700) height, the structure, pattern, and shape of the microneedles (700).
10. The method of producing microneedles of claim 9, wherein the light exposure time is 0.5 seconds.