

Innovative Technique for Manufacturing Collector 8, an Electrode for the Production of Polymeric Scaffold with more angles between Electrospinning Fibers

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ABSTRACT

The new idea for manufacturing collector 8 electronic collector 8 and to sharpen the edges of the electrode with enhancement speed to make easier for the operation of electrospinning in this field was done.

And it was done over the sharp edges of the collector to achieve the fibers which corresponds to the geometry of the collector to which the formation of fibers and by using the surveying and solving by computer and then we give it to the laser cutting instrument, the design will be done by careful cutting.

In these researches with using the sharp edges the fibers come to use and when the fibers much to the edge of the collector we should balance between them. With this method we produce more angles between fibers to culture and reserve cells, schematic solving was done to specify fiber distances between them and the situation of the cell culture the electrospinning with low restriction in this collector.

Keywords: Electrospinning, Collector system, Nanofibers, Tissue engineering.

Introduction

One of the difficult ties in front of us consists of suitable ways for the electrospinning in different shapes for the procedures. In these researches we used (pan) as the suitable polymer for it [1, 2].

For making fibers in one direction and making fiber angles on behalf of their balance can have suitable applied architecture [3]. In multi collector electrospinning can lead to form filters between these nano fibers [4].

And this architecture and the form of fibers can even be 3D [5].

For making different fibers we should have different shapes of collectors.

And this will cause collector. And this will cause the collector to be formed by different parts [6-8].

One of the most important usages of tissue Engineering is the use of nano lofty matrix as a scaffold for the growth and cell reproduction and muscular tissue [9].

In collector to form fibers you can make a split Thus fibers can fill the gap in collector and thus can cause scaffold in one direction [10].

You can regulate and balance fibers from collector with different shapes but each of them has different architecture [11].

In this research the fibers were studied with more angles between them.

To form electrospinning directional nano fibers and kind of angles between polymer fibers, it depends on geometric factor of the collector to put the fibers on each of them and for a network shape with different angles. With surveying and manufacturing collector (8) the electrode which is built with sharp edges can cause the fibers to break out edges and produce fibers with different angles we have more angles beside each other, we

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can have better cell complete growth and in other words we can say that the ratio of fibers to more angles can cause the high growth of cells. In this research we used two collectors with different measurements and different kinds. In previous methods with using surface collector which mechanically rotated gathered the fibers^[12].

And for the production of ideal fibers we should imagine the parameters because when the fibers gather on the collector surface they must have complete safe and also be careful about tearing the fibers during when gather together and the diameters of fibers and shapes should be regulate with side factors^[13-15].

kind and the percentage of polymer not to be teared and the fibers should be in a good condition^[16-18].

Materials and Method:

With using software cad we made collector and then with using cut lazer CNC it was cut down and fomed as electrodic collector which is shown in figure number (1).

By using design in CAD software we designed the collector and then by using CNC cutter we cutit to form collector (8) which is shown in figure No (2). One instrument with metallic mould which is made of copper and Aluminum in two different sizes was done. Which is shownin figure 3,4,5 and in figure No(5) collector has two edges which is shown after electrospinning actions which shows that every collector.

Was designed in different size and the distance between electrodes were more or less high or low but did not affect to our experimet because of the edge of the collector.

And for designing the collector we used some steps such as:

1-we used cad so, the designer allows to assem ble the model loehavior in working condition just equal to real conditions, real maps at 2D and 3D models.

2-In this section cam is a stage that the me thod of struc ture is evaluated and by asign specific software codes to c-cod tells the instrumat to what steps that the instrment has to be done for the me chine af it is to make the design easier and better.

Laser cut ting is a technique that cuts by lazer beams and is used in indutrial field Laser cutting has an exit using leading lazer beams by optic lazer beams radiate on the solids that want to be cut and the surface of the solid is cut which is cut very well amd from the beginnig to the end by operational cutting.

Laser beams radidte monotonously and cut things, and during operation some distances occur between electrospinning fibers.

One is from a head in two differat shapes that collectors have a distance a bout 30-40 centimeteres and has a marginal dist ance which has distance by two sides left or right about 1.5 milimeteres which separates two electrodes not to be connected from side it helps us not to have difficulty that is shown in figure no (2).

For better forming electrospinning we tried to put electrospinning on the collector to have good angles that electrodos number (1) to number (5), and (2) by (6), and (3) by (7), and, (4) by (8) fibers stick on these collectors regulary

and this is very difficult but we can control it abit to get better .

In number (2) is obvious.

The attention with cnc laser beams enhances and the weaknesses of this instrument is that it can not cut high dia meters and laser is used in different industries.

The most important matter is that dising cutting with laser cutting machine, we must sharpen the edge of the collector and we must ply plastic in sulator and make a frame for the collector to fixit.

And the electric circulation to all the electrodes will be fixed and has a connection and distributor.

But in electro research it has no application except electronic current.

Because of this it must be insulated by all sides. because if it is not insulated it may cause parasit by the operation and the regulati on the fibers on the electrodes, and the fibers stick to all sides on the collector.

And the fibers can not fixin their places. the materials in this research from poly mer poly acry lonit rile and solvent DMF is used and experimented .

We used pan polyer because of low density, suitable thermal stability, highsolidity and suitable elasticity moduli and mechanical specification, such as high tensile solidity nottobe cut during experiment and not to have weaknesses between collector edges.

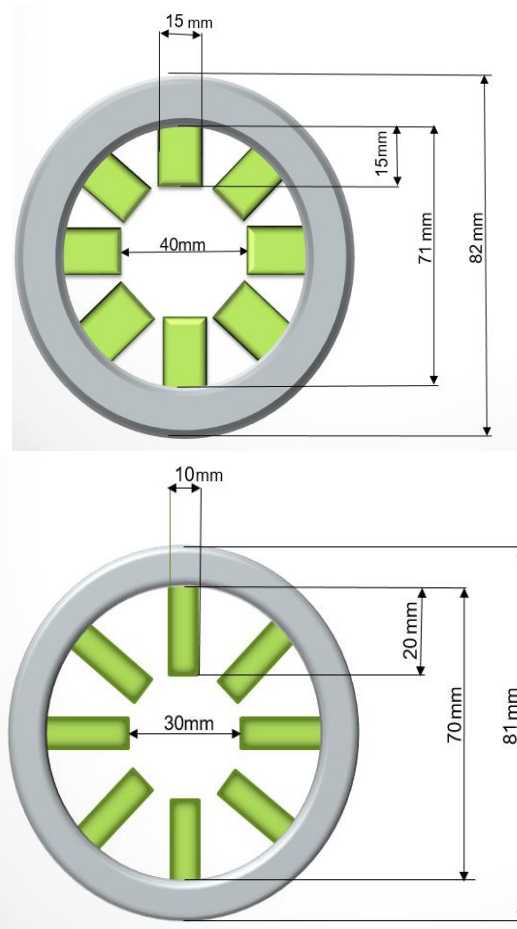


Figure 1. design of the collector map with two different sizes with measurements .

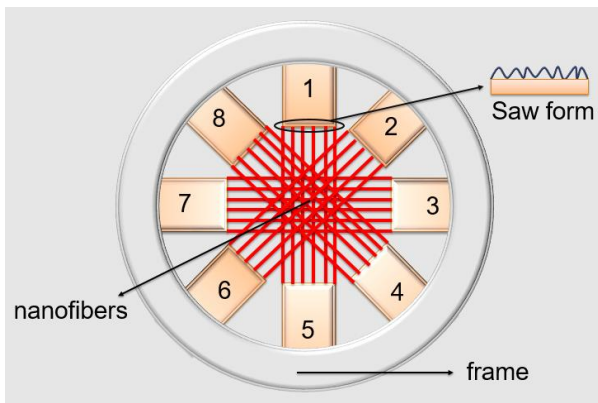


Figure 2. Number on the electrodes and the sharpe edges of electordes that must be embeded the electrode till the fibers stick to ito

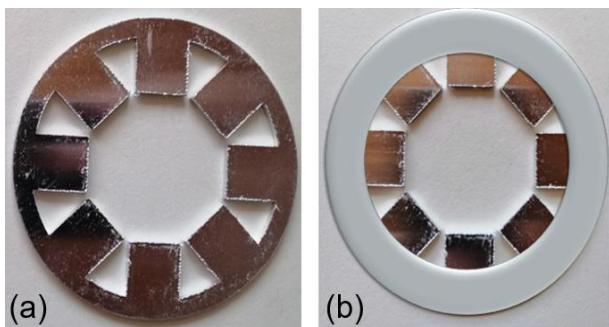


Figure 3. Collector (8) made by aluminum with sharp edges by dimensin 15 mm and the 2 mm diameter without ferem (a) and (b) with ferem in sulator onit sides.

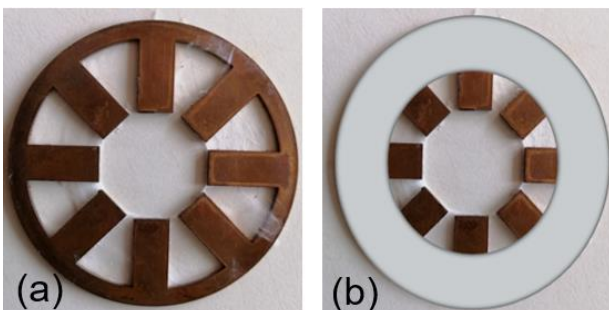


Figure 4. Shows colleactor (8) made from copper with electrode sharpe edges. 10mm * 20mm and thick ness 2mm
a) Minus form b) with insulator on its sides.



Figure 5. Collector that has two electrodes with sharp edges.

In figure No (6) we have a view of collector (8) electrodic mechanism, in these electrospinning functions.



Figure 6. Shows the structure and the mood of settle collector (8) on the bracket.

Results:

In this collector that is shown with sharp edges fibers with low restriction exists in this collector and thus can be trapped conveniently you can even have the best electro spining in a short time and the poly mers which are expensive and restric ted can help us not to lose their value. the measne of altitudes for sharp edges (0.7 mm) can be seen by eyes .

And the sharp edges ey electrodes and with out edge is shown in figure (7)

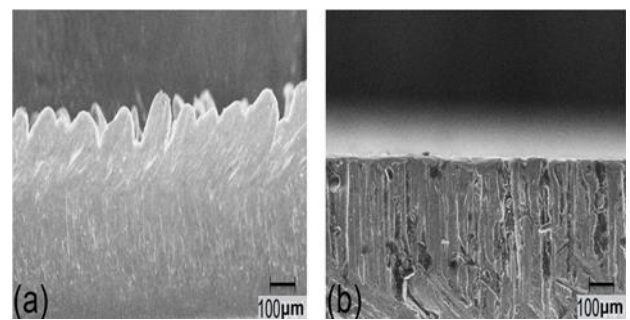


Figure 7: Has shown by sem a) with sharp edges like saw. b) without sharp edges and simple.

for these collectors we must close behind the collector till when the fibers accumlate no air doesn't come is not to for bid the geomet ry of the fibers.

but in those researches that we did with closing or not closing be hind the collector also we can do this action for the sake of electrode as shown in figne 8,9 that shows the poly merie fibers in the center of collector.

polymer polyacry lonitrille has speci fi cations like high solidiy and suitable elasticity module, me chanical speci fication such as high tension solidiy because of this used for this experiment that should have good solidiy tension not tobe torn in the time of accumulation and for the solvent we used DMF that is shown in table (1)

Table 1. Shows pan polymer with %13 - %14 - %15 percentages with different nozzle to collector distance and different voltages that the operation was done.

Applied Voltage (kv)	Spining time (Minutes)	Rate flow (Ml/h)	Distance (cm)	Concentration (Wt%)
20	3	0.2	18	13%
19	4	0.2	16	13%
18	5	0.2	14	13%
17.5	4	0.2	12	14%
21	3	0.3	20	14%
20	5	0.3	18	14%
19	5	0.3	14	14%
17	4	0.3	16	15%

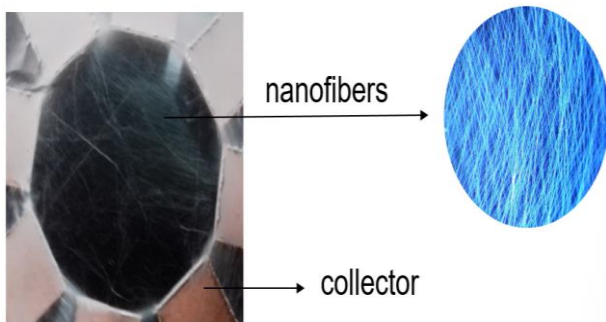


Figure 8. Collector with (8) electrodes with sharp edges and the accumul at ion of fibers in the center of the collector after the electrospinning action

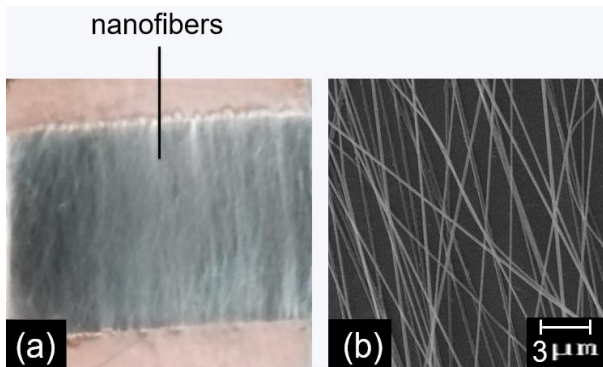


Figure 9. Section (a) collector with two edges the accumulation of fibers between two sharp edge after the electrospinning (b) shows picture of (sem) Fibers accumulated between Two electrodes.

And after the action with using collector (8) we see can electrodes that we must attention and we found very good angles in figure (10) wese part of these actions and the can culture is shown shemati cally on the photo and the difference between electrode angles that is shown between them that is shown for cell culture and angles not sen in figure (11).

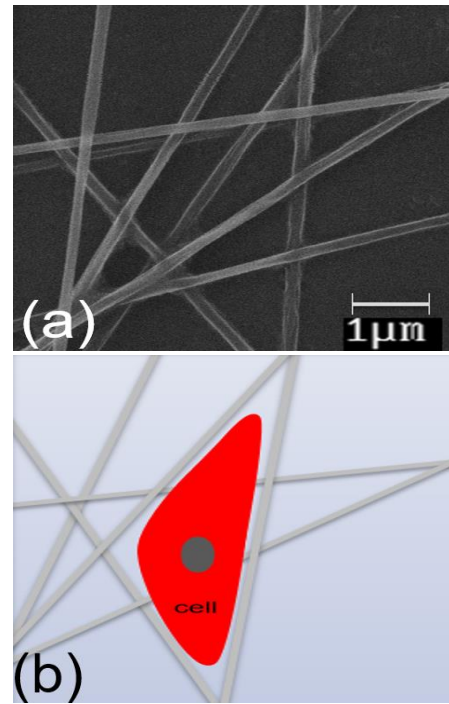


Figure 10. Shows a) electrospinning fibers and angle having fibers shown .b) shows schematic form of angles between fibers and place finding during growth.

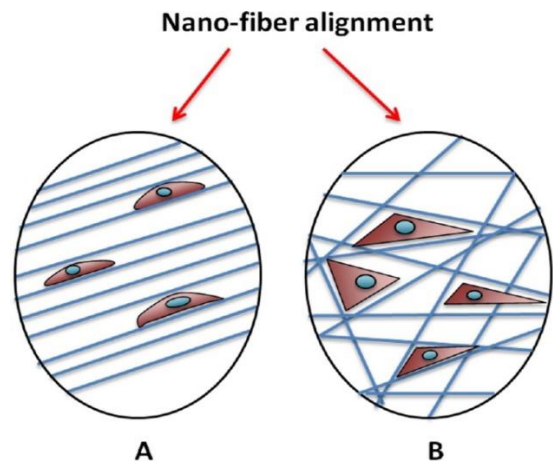


Figure 11. Difference between two pictures (a) cell cul tured with out good quality and (b) cell culture with good quality and complete suitable condition.

On the edges of collector picture of (sem) is seen and in figure (12) Collector with sharp edge like saw and can conveniently the electrospinning fibers and trap them.

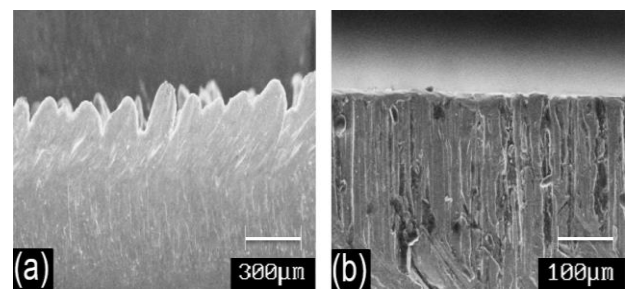


Figure 12. a) Sharp edge of collector b) No sharp edge of collector

Discussion

In these researches we worked on electrospinning on two collectors with 8 electrodes with out sharp edge and by sharp edge and we understood that electrode which accumulates with sharp edges acts much more to that edge which is not sharp and the fibers will be trapped by it.

Thus we will have fast and convenient electrospinning and these sharp edges help us very much. researches we used collector (8) that must circulate round a circle to absorb the fibers to it self and must spend along time for the operation but with this collector with out rotating and the steady state of the instrument in a short time we can do it.

In future we can trap with different geometry rules the electrospinning fibers with different angles by this technique:

Conclusion

Collector with sharp edges give us this opportunity to trap electrodes pinnig fibers and it is shown in the pictures and these edges help us very much in action.

And we found ways that during cell culture to have good opportunity for the cell growth. we can also reach to the shapes we want and in future we can design this collector that electrospinning fibers with angles between fibers with (3D).

Simultaneously use some polymers do the electrospinning action with edges of the collector and even we can design different collectors and cut till our imagination come to fact.

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