

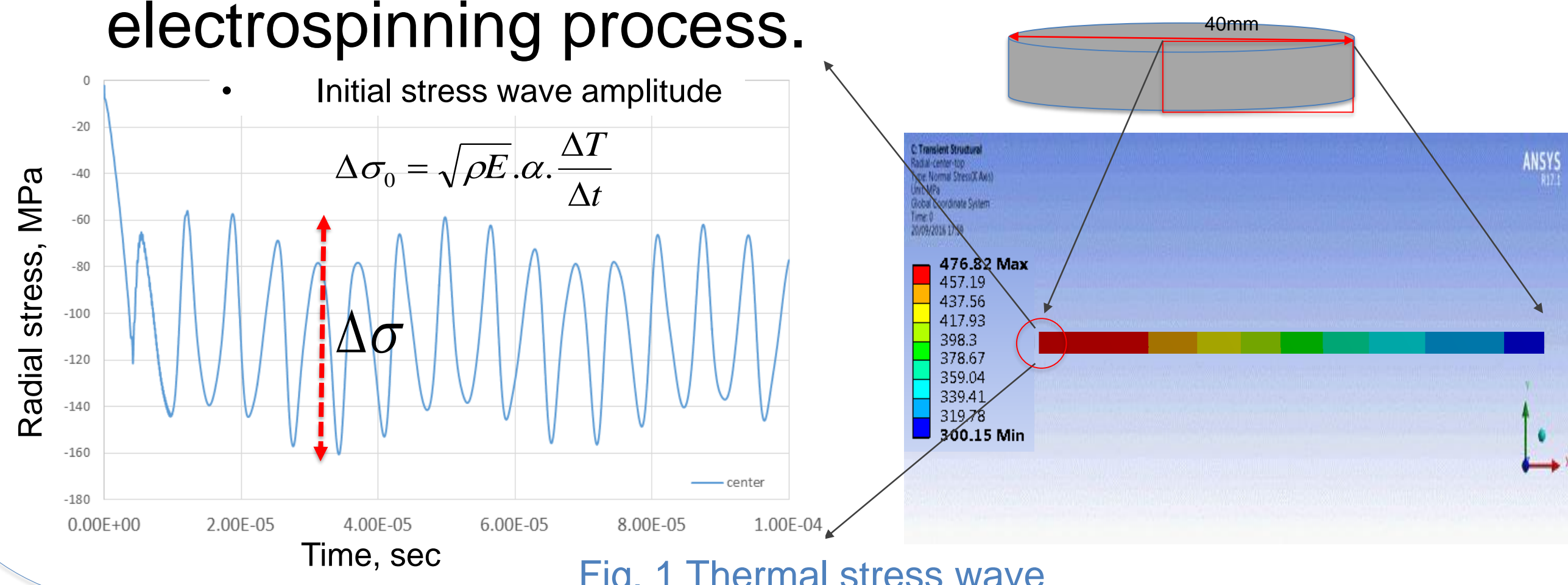
# Improvised Electrospinning Set up for Thicker Ceramic Nanofiber Mat for High Power Targets

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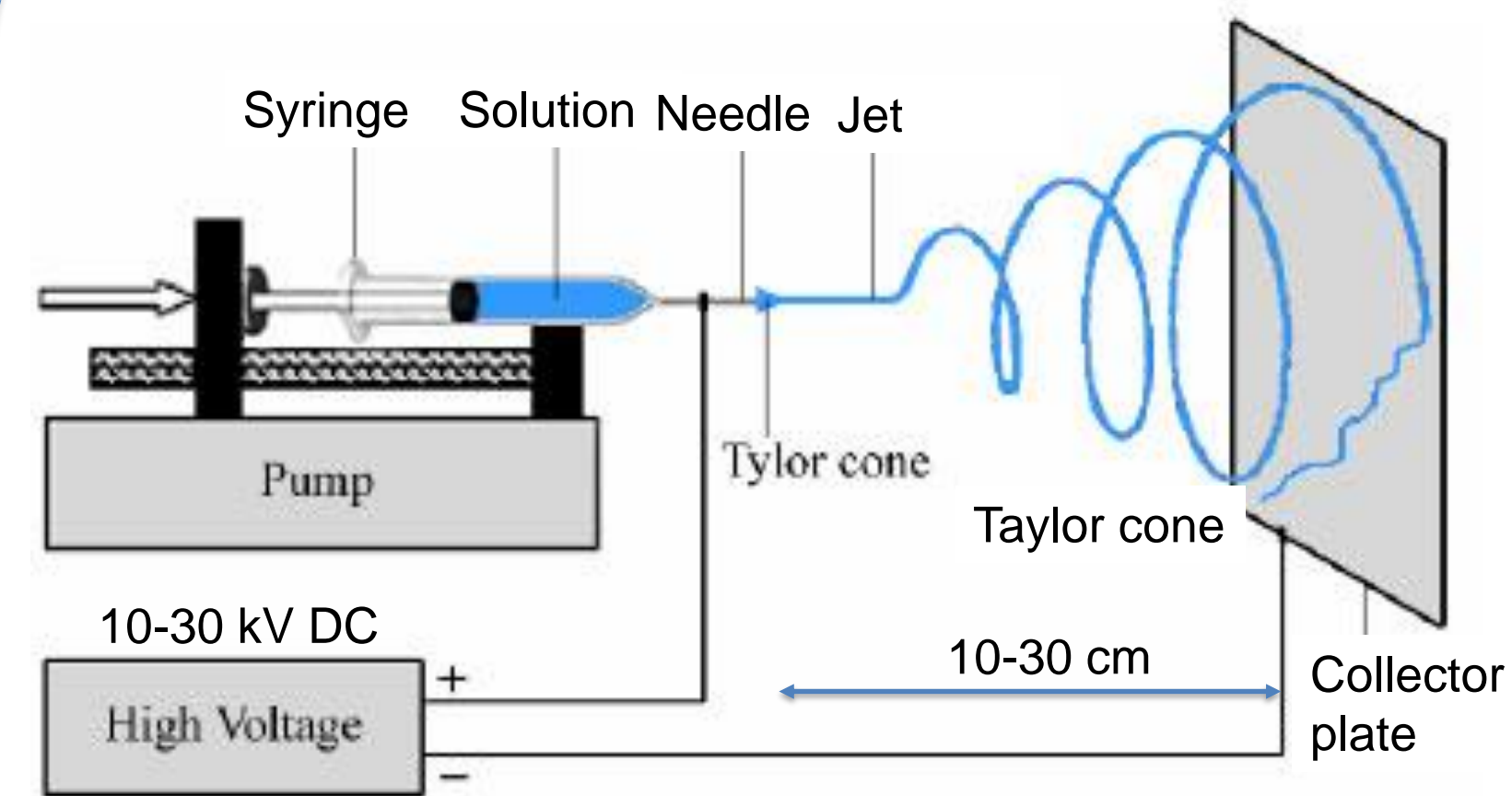
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## Introduction and Objectives

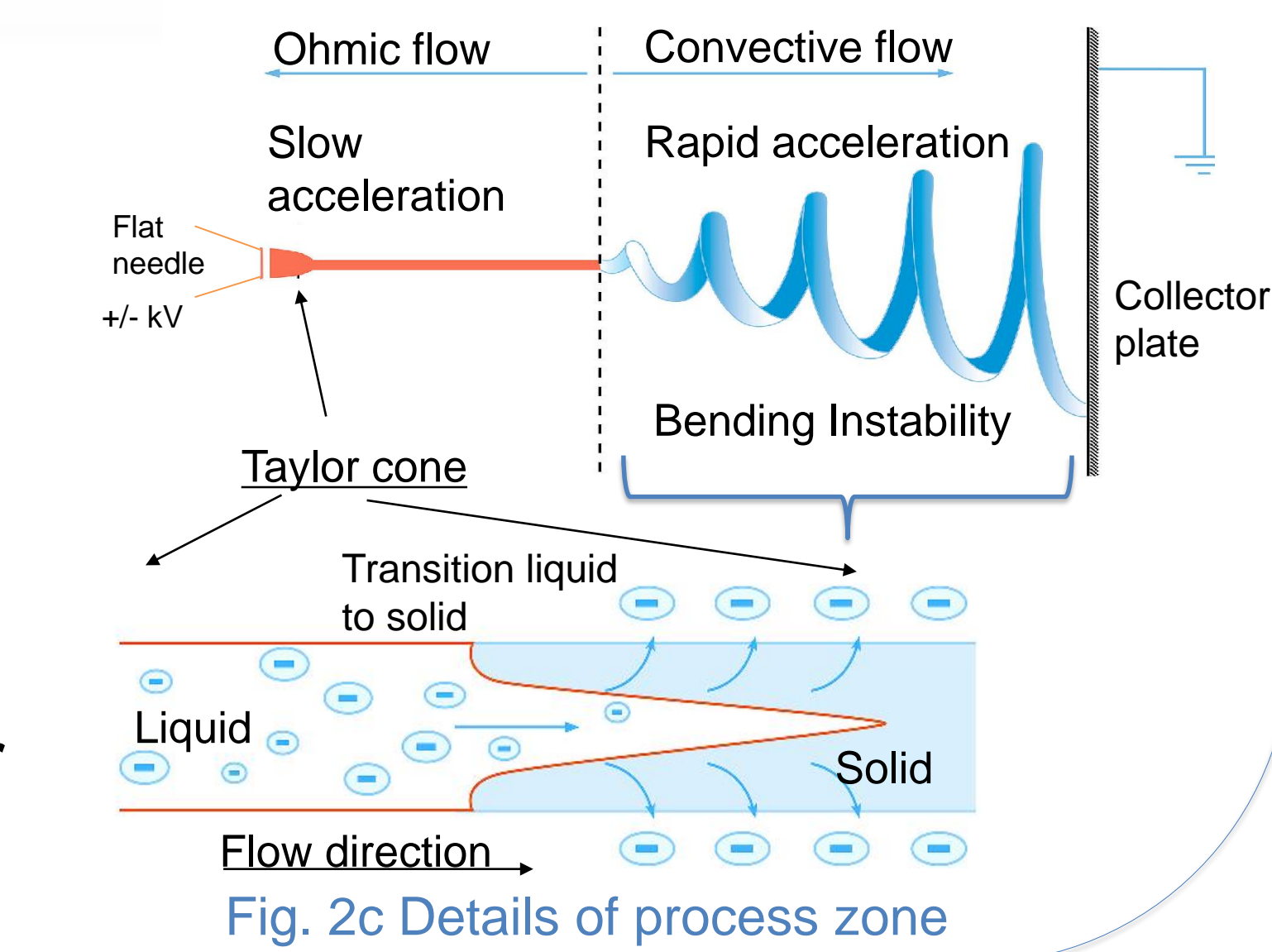
- In high energy particle physics there is a demand for multi-MW high performance particle production targets.
- Nanofiber microstructure will have better performance than current solid targets in mitigating increased thermal stress waves, radiation damage.
- Objective is to fabricate thicker ceramic/metallic nano-fiber with high strength, thermal shock resistance using low cost electrospinning process.



## Electrospinning process

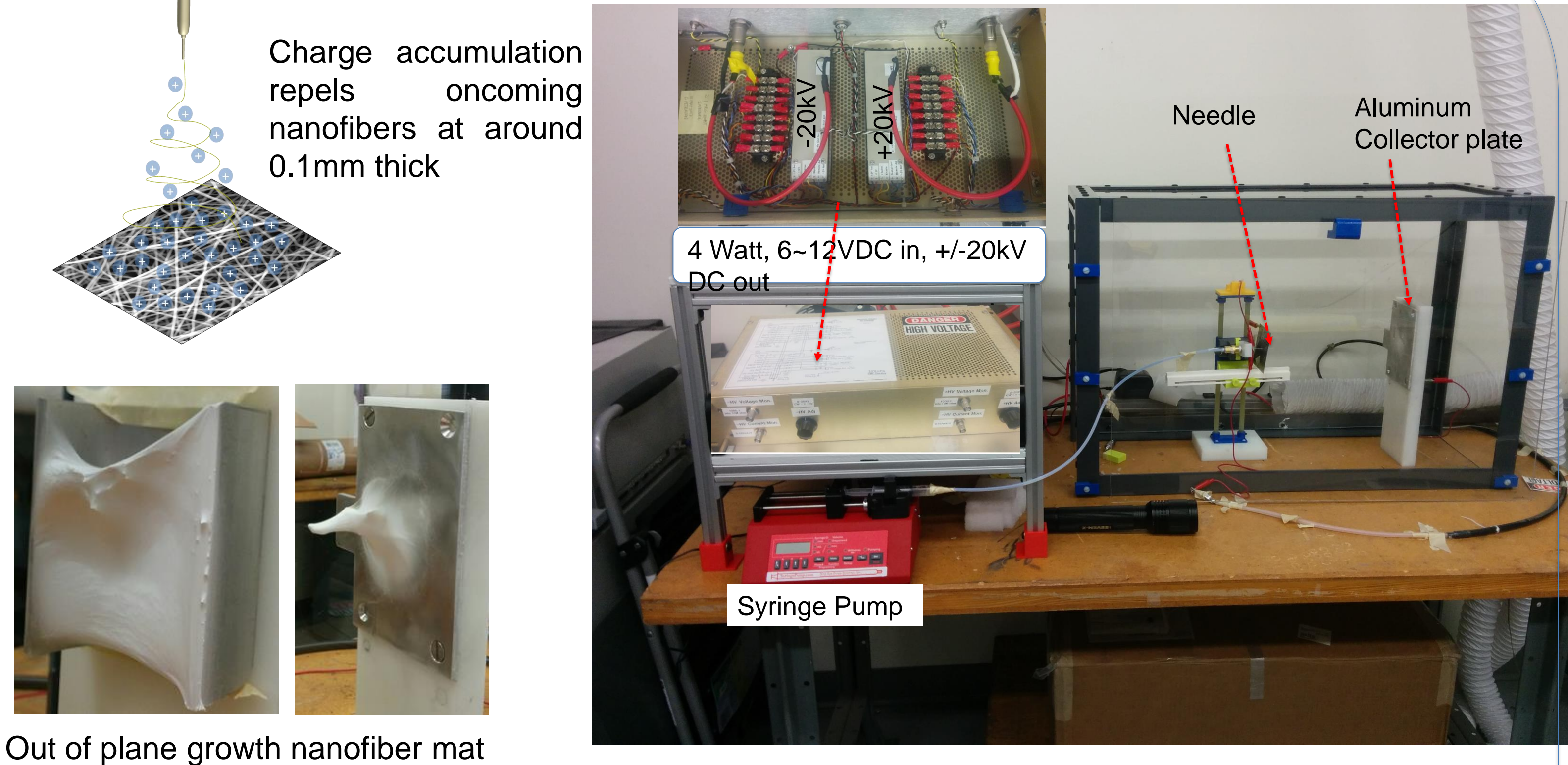


Process carried out at room temp. and atm. pressure



Process initiates when electrostatic repulsion over comes surface tension

## Improvised electrospin set up



Out of plane growth nanofiber mat

- Much safe to use (120W→4W!)
- Mobile compact unit → Can be run on 9 or 12 V battery
- Dual polarity operation

## Thicker mat with ionizer

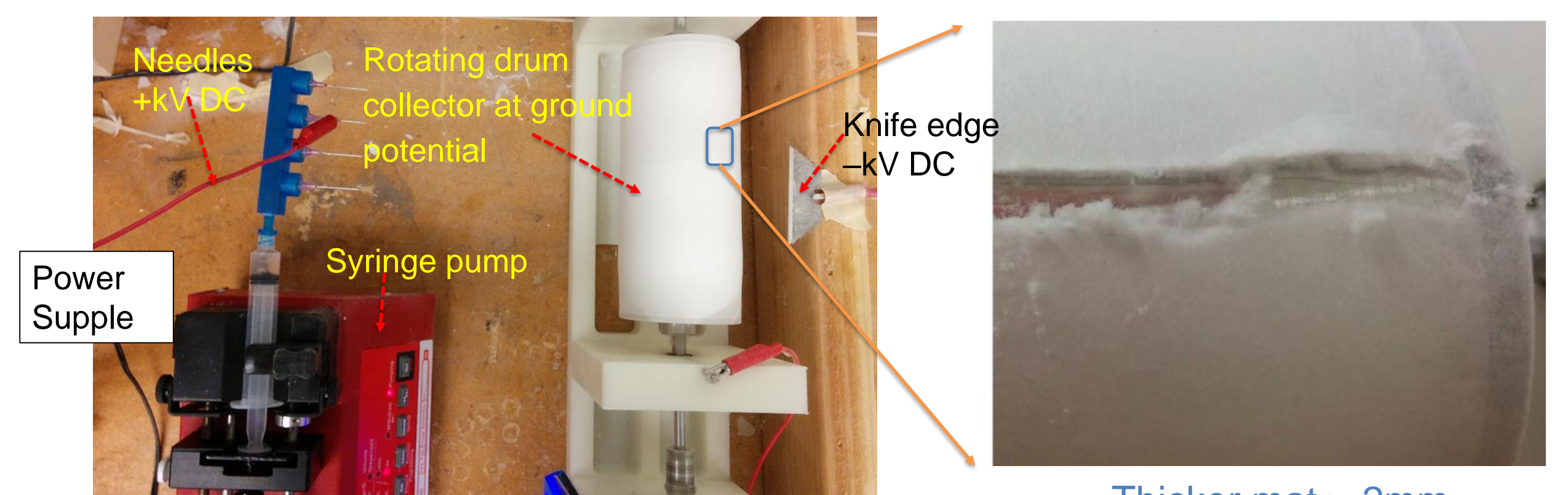


Fig. 4a Dual polarity electrospinning- ionizer

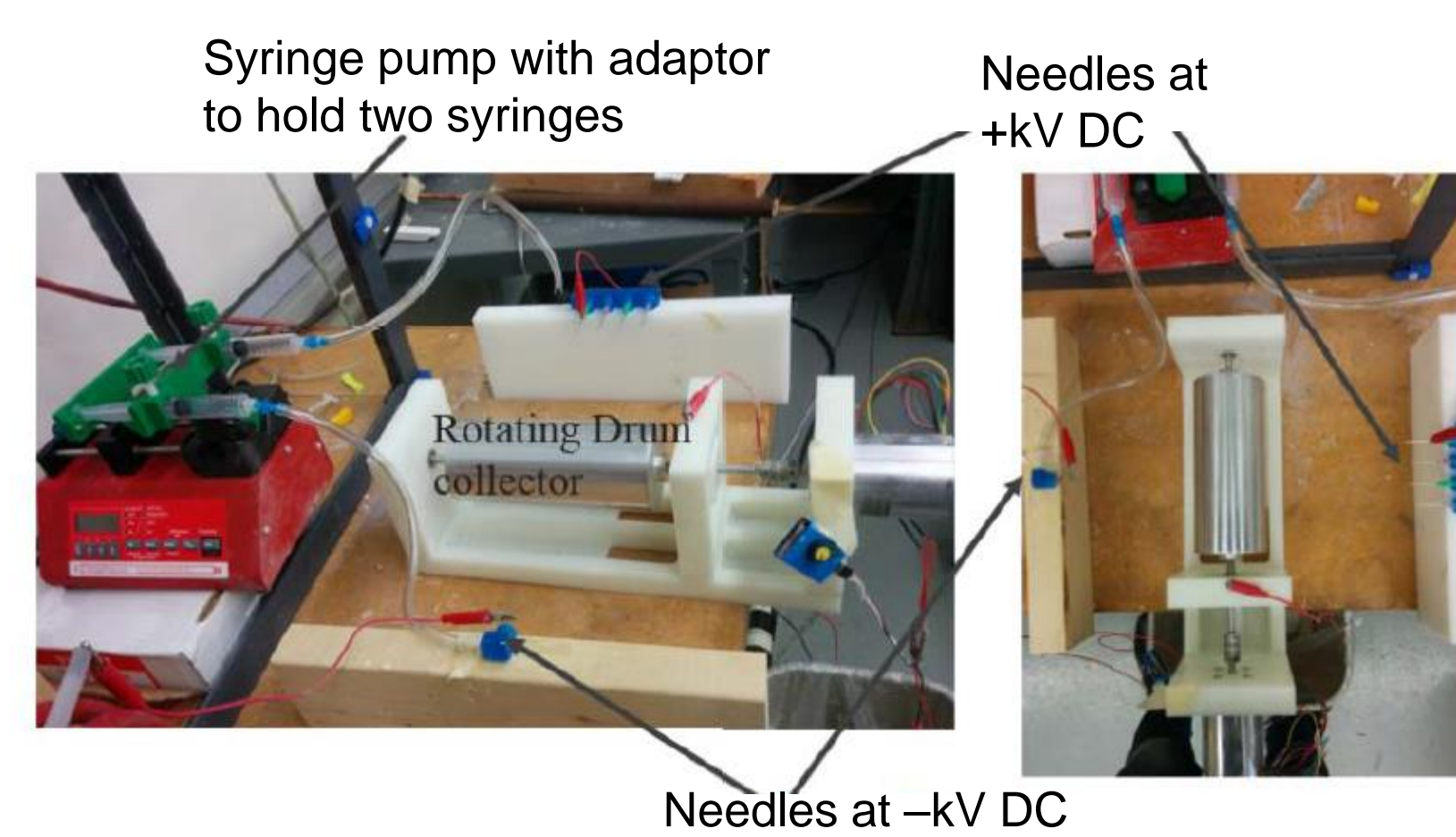


Fig. 4b Dual polarity electrospinning- opposite charged needles

Rotating drum collector brings the positively charged nanofiber to negatively charged ions / nanofibers and neutralize them

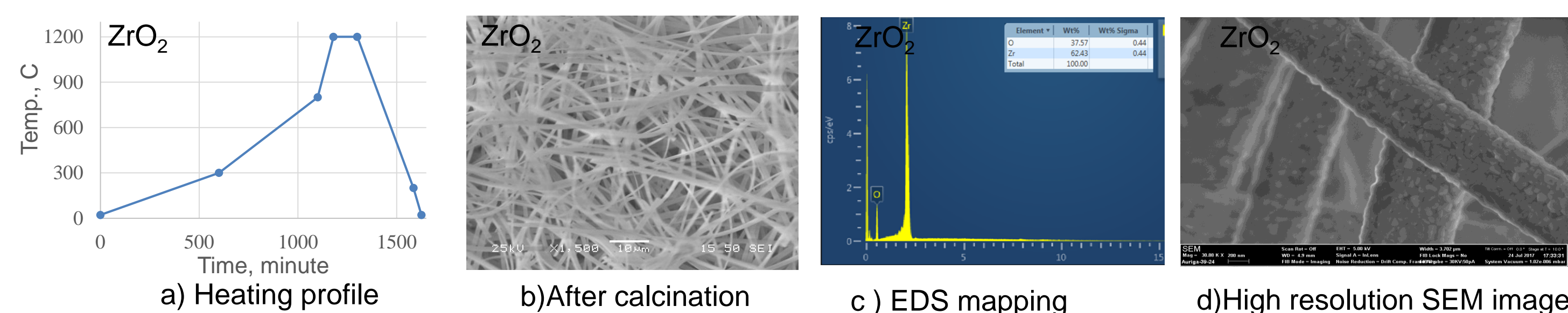
## Ceramic/metallic nanofiber production

Inorganic precursor:

(Zirconium Carbonate + Acetic Acid → Zirconia)

Polymer solution : PVP + Ethanol / Aceton

Calcination (Heat treatment)



## Summary and Future work

- Set up a low cost, low power, safer electrospinning unit.
- Success in fabricating metallic and ceramic nanofiber.
- Thicker nanofiber production using dual polarity spinning.
- Ceramic nanofiber looks promising as future candidate target material.

### Future work

- Single fiber bending test for tensile strength.
- Single fiber thermal properties evaluation.
- Radiation damage studies using ion irradiation.