

FLUIDNATEK[®]

**EQUIPMENT FOR ADVANCED NANOFIBER AND NANOPARTICLE
RESEARCH AND MANUFACTURING**

by  **BioInicia**
Innovative Polymer
Applications

THE FLUIDNATEK TOOLS

we create the future

USE CASES

FLUIDNATEK Lab Tools are research instruments designed for the fabrication of small spherical and fibrous particles (with diameters ranging from the micro to the nanoscale) as well as for the creation of thin film coatings. The particle manufacturing process of FLUIDNATEK tools relies on **eStretching (electrospray and electrospinning)**.

Using physical forces, instead of chemical, **micro & nano particles** of many different materials can be obtained: biopolymers, proteins, carbohydrates, macromolecules, synthetic and natural polymers, sol-gel materials, ceramics and glasses.



CUSTOMER-DRIVEN

FLUIDNATEK tools are adapted to customer needs by their customization with an **extensive range of accessories**:

- Co-axial, Multi-axial and bespoke nozzles
- Rotating collectors
- Automated motion (1D, 2D, 3D)
- Fluid heating
- Parallel injection heads (to increase productivity)
- Continuous particle collection

HIGH THROUGHPUT

FLUIDNATEK Tools for Industry are designed to scale any of the eStretching processing techniques (eSpinning, eSpraying, co-eStretching and multi-axial eStretching) from lab, through pilot line, to industrial volume production.

The high flexibility of FLUIDNATEK equipment designs is based on a broad experience in the volume production of nanosize-controlled materials, allowing Biolinica to offer the best solution to the particular specifications and requirements of your application.



PRODUCTIVE & RELIABLE

The ambient conditions can be controlled to meet the requirements of customers' applications: relative humidity, temperature, gas composition (i.e. O2 absence, inert conditions), cleanliness and sterility. Fluidnatek industrial tools meet the most stringent hygienic design criteria. Therefore, they can be used to produce nanomaterials for the pharma, biomedical, food and cosmetic industries.

Biolinica also provides its industrial clients with proper systems to increase their productivity (remote control, automated cleaning, solvent recovery systems) and to obey the required standards (i.e. abatement exhaust systems).

THE FLUIDNATEK TOOLS

quality, knowledge and confidence

KEY BENEFITS



FLEXIBILITY

Adaptable to any scale: from **laboratory**, through **pre-series** to **pilot** and **industrial** production.
Applicable for an **exceptionally wide range of materials and solvents**



FUNCTIONALITY

Able to up-scale all the eStretching processes (including **co-axial** and **multi-axial**)
Touch screen controlled
The tools can be **remotely operated**



VERSATILE

Work with many types of materials and solvents
Field upgradable with optional accessories



QUALITY

Biolnacia's patented emitter designs ensure **very good control** on the process, enabling a **tight particle size distribution** and high product **homogeneity**. Ideal for high value added products



ROBUSTNESS and SAFETY

Extensively **peer tested** by our worldwide customers
FLUIDNATEK tools are **compliant** with the required **regional and industrial standards**
Proper solvent exhaust system removes the risk of fire and explosion



CUSTOMER-DRIVEN

FLUIDNATEK has a long track record in providing tailored solutions that **meet customers' special needs** and **fit your budget**



THROUGHPUT

Modularity enables the scaling to volume production at both **pilot and industrial scales**
The production scales with the number of emission heads

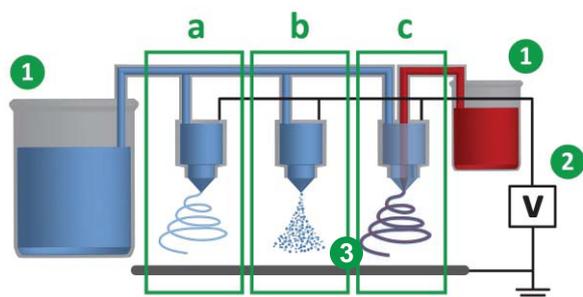
FLUIDNATEK TECHNOLOGY

eStretching

Over the past decade the electro-stretching or eStretching of liquids has been gathering increasing interest from academia and industry. This technology, through its two main approaches (electrospinning and electrospraying) offers **simplicity and flexibility** for the development and production of novel micro, submicro and nanomaterials for many different applications.

The eStretching technology relies on the application of strong electric forces to liquids. When a high enough voltage (tens of kV) is applied to a liquid surface, a micro-jet may be issued. The diameter of the emitted liquid jet depends mainly on the electrical conductivity of the liquid, ranging from the microscale (for non-conducting liquids) to the submicron and the nanometer range when highly conducting liquids or solutions are used. Downstream, depending on the rheology of the liquid, the jet breaks up into droplets (electrospraying or eSpraying) or undergoes a whip-like motion (electrospinning or eSpinning).

eStretching™ Process

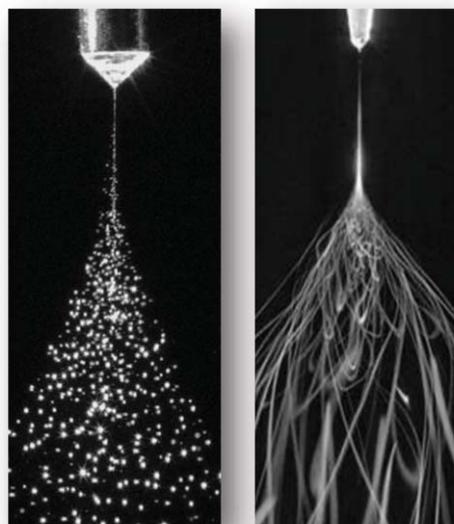


- 1 Optimized polymer solution(s) are supplied to the emitter(s) at a controlled rate. Additives of interest can be also added to the solution.
- 2 The solution(s) are electrified with a prescribed polarity via a high voltage power supply. The electric potential is applied between the emitter(s) and the collecting target.
- 3 Liquid jets are issued from the emitter(s) and accelerated by the high potential. The particle/fibers travel towards the collector while the solvent flashes off. Biolnacia's proprietary emitter designs allow control of the dimensions and morphology of the nanomaterials produced. **Fluidnatek LE-100** can be operated in the following configurations:

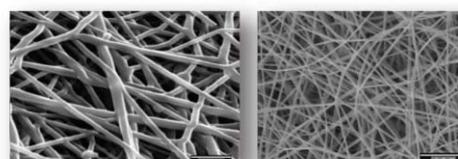
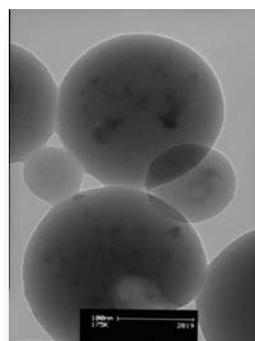
(a) **eSpinning** mode to produced a multitude of nanofibers materials.

(b) **eSpraying** mode to produce a variety of nanoparticles.

(c) **Co- and multi-axial eStretching** modes to fabricate multicomponent or hollow nano- and micromaterials (e.g. hollow fibers, sheath-core fibers, islands-in-the-sea fibers, core-shell capsules and particles).



eSpraying (left) and eSpinning (right) modes



Nanoparticles and nanofibers obtained by eStretching with FLUIDNATEK tools.

MARKETS AND APPLICATIONS



Due to its flexibility, FLUIDNATEK equipment are ideal to both research and mass produce eStretched nanomaterials that can be applied in diverse areas such as:

- ▶ NUTRACEUTICALS
- ▶ IMMOBILIZATION OF LIVE CELLS, ENZYMES
- ▶ FLAVOR AND FRAGRANCE MASKING
- ▶ FOOD PACKAGING
- ▶ FUNCTIONAL FOODS
- ▶ COSMETICS
- ▶ DRUG DELIVERY
- ▶ BIOMEDICAL & TISSUE ENGINEERING
- ▶ MICRO & NANO ENCAPSULATION
- ▶ CATALYSIS
- ▶ ENERGY STORAGE
- ▶ BATTERY SEPARATORS
- ▶ FUNCTIONAL TEXTILES
- ▶ PHASE CHANGE MATERIALS
- ▶ FILTRATION AND SEPARATION
- ▶ AFFINITY MEMBRANES
- ▶ COMPOSITES



ABOUT BIOINICIA

comitted to excellency

BioInicia is a service provider offering a complete range of support services from **contract material development, contract material manufacturing** and the supply of (customized) manufacturing equipment to those customers that eventually wish to manufacture proprietary materials in-house.

Under **FLUIDNATEK** brand, BioInicia offers a line of materials manufacturing equipment that scales from table top equipment for the lab space to fully automated equipment for industrial manufacturing. All equipment is functionally identical, i.e. manufacturing recipes developed on a table-top R&D system are guaranteed to run and produce identical results on the industrial system (full scalability from lab to fab)!

BioInicia's team consists of technologists and application scientists recognized in the field of

materials science, especially in the production of micro and nano particles/fibers by eSpraying and eSpinning. FLUIDNATEK tools are also being developed by a team of engineers with long track record in the design, automation and manufacturing of scientific instruments and industrial equipment. Together they constitute a group of enthusiastic experts that will provide BioInicia's clients with a wide variety of robust and functional tools specially conceived for either R&D or volume production.

BioInicia has a focus on bio-materials with extensive knowledge on the specific requirements for different delivery matrices in the food, pharma and biomedical areas and their corresponding legislation requirements.



BIOINICIA WORLDWIDE

BIOINICIA is headquartered in Valencia (SPAIN) where the R&D, equipment manufacturing and nanomaterials production facilities are located.

Direct sales, marketing, and product support in Europe & North America.

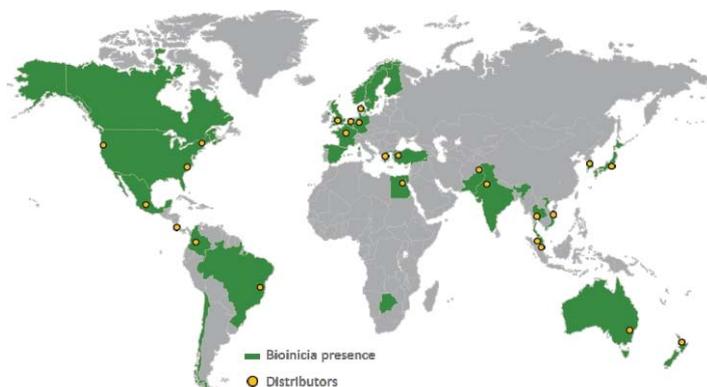
In order to offer the best technical and commercial assistance to our customers, BioInicia has established a worldwide network of distributors, commercial partners, and collaborators.

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Appointed distributor