



WHAT WE DO?

- YFLOW IS A **NANOTECHNOLOGY** COMPANY.
- USES **ELECTRO-HYDRODYNAMIC (EHD) MICRO-FLUIDIC TECHNIQUES** TO GENERATE FINE AND ULTRAFINE ELECTRIFIED **COAXIAL MICROJETS (PATENTED TECHNOLOGY)** OF TWO IMMISCIBLE LIQUIDS.
- CONTROLLING KEY PARAMETERS, NANOPARTICLES SUCH AS **CAPSULES, HOLLOW SPHERES, HOLLOW FIBERS & COAXIAL FIBERS** CAN BE FORMED.

HISTORY

Journal of Fluid Mechanics

CURRENT EMITTED BY HIGHLY CONDUCTING TAYLOR CONES.

YFLOW IS FOUNDED (SPIN-OFF; UNIVERSITIES OF MÁLAGA & SEVILLA).



FIRST R&D CONTRACT WITH KRAFT FOODS

J | A | C | S
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

ELECTRICALLY FORCED COAXIAL NANOJETS FOR ONE-STEP HOLLOW NANOFIBER DESIGN.



YFLOW MOVED ITS HEADQUARTERS TO NEW FACILITIES AT THE TECHNOLOGIC PARK OF ANDALUCÍA (MÁLAGA).

1990

1994

2000

2001

2002

2004

2005

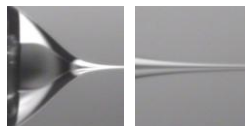
2006

2009

I.G. LOSCERTALES (UMA) AND ANTONIO BARRERO (US) STARTED WORKING IN EHD



INVENTED THE COAXIAL ELECTRIFIED JETS TECHNOLOGY



MICRO/NANO ENCAPSULATION VIA ELECTRIFIED COAXIAL LIQUID JETS.



YFLOW SOLD THE FIRST EHD LAB EQUIPMENT



YFLOW SOLD THE FIRST PILOT SCALE EHD EQUIPMENT



EXPERIENCE IN EHD

□ PUBLICATIONS: MORE THAN 40 IN ELECTRO-HYDRO-DYNAMICS

- MICRO/NANO ENCAPSULATION VIA ELECTRIFIED COAXIAL LIQUID JETS. **SCIENCE (2002)**.
- CURRENT EMITTED BY HIGHLY CONDUCTING TAYLOR CONES. **JFM (1994)**.
- ELECTRICALLY FORCED COAXIAL NANOJETS FOR ONE-STEP HOLLOW NANOFIBER DESIGN. **JACS (2004)**

Science

IAAAS

Journal of Fluid Mechanics


JACS
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

□ REFERENCES: MORE THAN 2000

(14) Loscertales, I.G.; Barrero, A.; Marquez, M.; Spretz, R.; Velarde- 140. Loscertales, I.G., A. Barrero, I. Guerrero, R. Cortijo, M. Marquez, and A.M. Ortiz, R.; Larsen, G. *I. Am. Chem. Soc.* **2004**, 126, 5376–5377. Ganan-Calvo, *Micro/nano encapsulation via electrified coaxial liquid jets*. *Science*, 2002, **295**(5560): p. 1695-1698.

[85] I.G. Loscertales, A. Barrero, I. Guerrero, R. Cortijo, M. Marquez, A.M. Gañán-Calvo. Micro/Nano encapsulation via electrified co-axial liquid jets. *Science*, **295**, 1695 (2002).

□ PATENTS & LICENSES FILED:

- INTERNATIONAL PATENT PCT WO 02060275A1. **PRODUCTION OF CAPSULES AND PARTICLES FOR IMPROVEMENT OF FOOD PRODUCTS**. LICENSED TO ITS USE IN FOOD TECHNOLOGY.
- **DEVICE AND METHOD FOR PRODUCING STATIONARY MULTI-COMPONENT LIQUID CAPILLARY STREAMS AND MICROMETRIC AND NANOMETRIC SIZED CAPSULES**, PCT WO 02/060591A1.
- **MICROPARTICLES (FOOD GRADED)**. GB2487794. 
- **METHOD FOR PRODUCING NANOFIBERS OF EPOXY RESIN FOR COMPOSITE LAMINATES OF AERONAUTICAL STRUCTURES TO IMPROVE THEIR ELECTROMAGNETIC CHARACTERISTICS**, EP 08382075.3.

kraft foods
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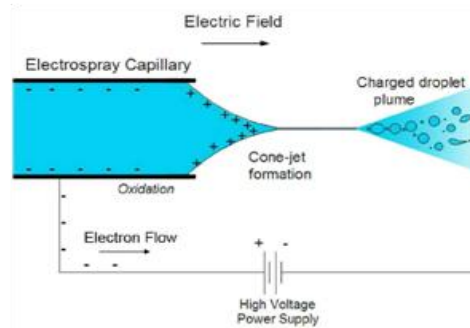
Yflow[®]
Nanotechnology Solutions

EADS
CASA 

THE TECHNOLOGY

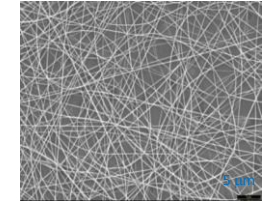
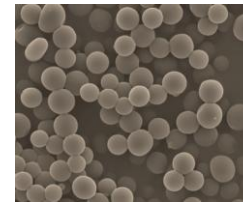
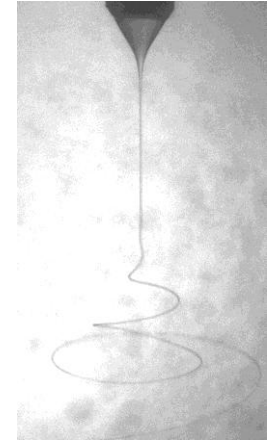
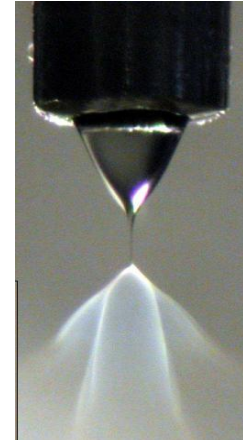
ELECTRIFIED JET

- A **LIQUID** SOLUTION WITH CERTAIN K_{ELECT} FLOWS THROUGH A CAPILLARY TUBE CONNECTED TO A POWER SOURCE. E_{ELECT} OVERCOMES THE SURFACE TENSION OF LIQUID, AND THE MENISCUS TURNS INTO **THE TAYLOR CONE**



- FROM THE TIP OF THE CONE APPEARS A JET (D_j) THAT BREAKS UP INTO **MONODISPERSE** DROPLETS ($D_{DROPLET}$). BOTH ARE INDEPENDENT OF THE DIAMETER OF THE NEEDLE .
- **SCALING LAWS** PREDICTS: $D_{DROPLET} \propto I_{current}$
- **PRODUCTION OF MICRO AND NANOPARTICLES** (SPHERICAL & FIBER-SHAPED) WHICH **DIAMETERS ARE IN THE RANGE (10 nm – 10 mm)**.

ELECTROSPRAY ELECTROSPINNING

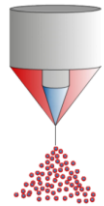
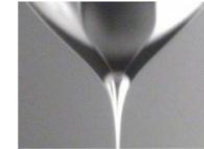


PATENTED TECHNOLOGY

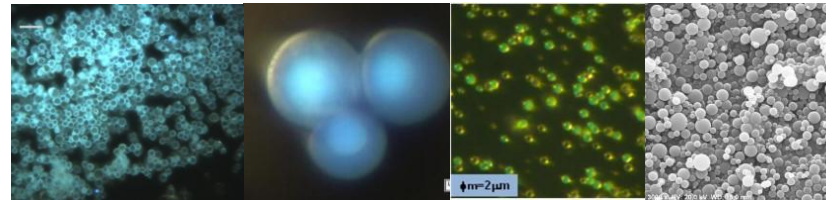
ELECTRIFIED COAXIAL JETS



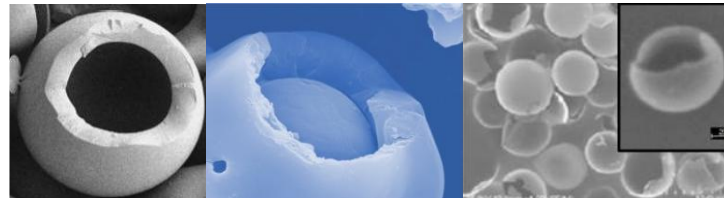
MICRO/NANO ENCAPSULATION VIA ELECTRIFIED COAXIAL LIQUID JETS. I. G. LOSCERTALES, A. BARRERO, I GUERRERO, R. CORTIJO, M. MARQUEZ, AND A.M. GAÑÁN-CALVO. SCIENCE 295, 1695-1698, 2002.



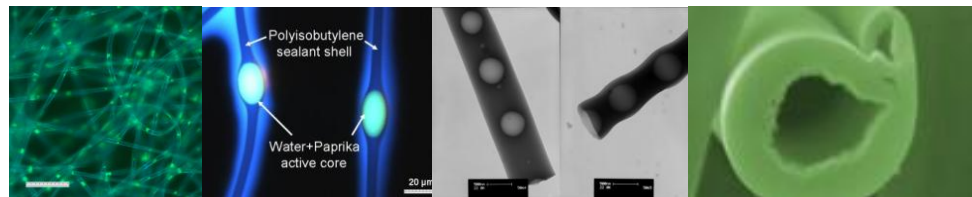
COAXIAL
ELECTROSPRAY



Coaxial Nanoarticles



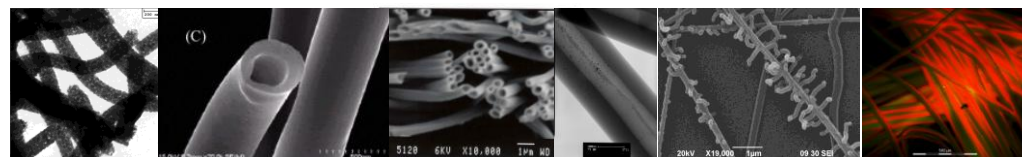
Hollow Nanoparticles



Coaxial Nanofibers



COAXIAL
ELECTROSPINNING



Metallic Oxide Nanofibers

Hollow Nanofibers

Ramified
Nanofibers

Side-by-side
Nanofibers

DIFFERENT
NANO-
STRUCTURES
OBTAINED BY
COAXIAL EHD
TECHNIQUES

INDUSTRIAL APPLICATIONS

“MICROENCAPSULATION”

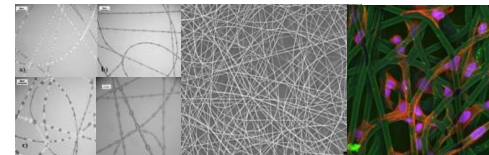
PHARMACEUTICAL

- CONTROLLED DRUG RELEASE.
- TISSUE ENGINEERING.
- NANO – METALLIC PARTICLES FOR SPECIFIC TREATMENT.



BIOMEDICINE

- TISSUE ENGINEERING
- WOUND HEALING.
- DRUG DELIVERY
- MEDICAL DEVICES



COSMETIC , DETERGENTS & ADHESIVES

- CONTROLLED RELEASE.
- MICRO/NANO EMULSIONS.
- ACTIVE MOLECULES PROTECTION.
- PARTICLES WITH HIGH SPECIFIC AREA FOR UV ABSORPTION.



FOOD

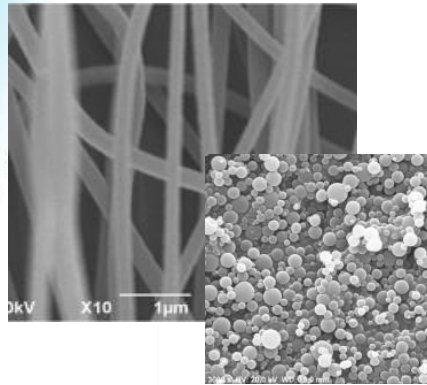
- SMART PACKAGING.
- SHELF-LIFE IMPROVING (ACTIVE PACKAGING).
- MICRO/NANO EMULSIONS.
- ENCAPSULATION OF BAD FLAVORS COMPOUNDS.



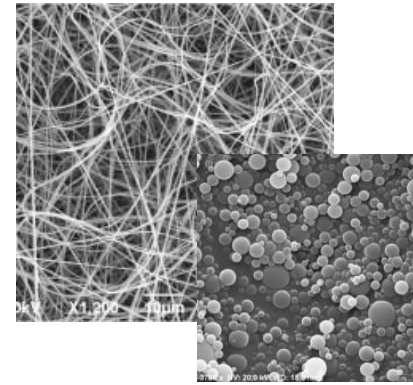
BIOPOLYMERS

NANOSTRUCTURED BY EHD TECHNIQUES FOR
BIOMEDICAL APPLICATIONS

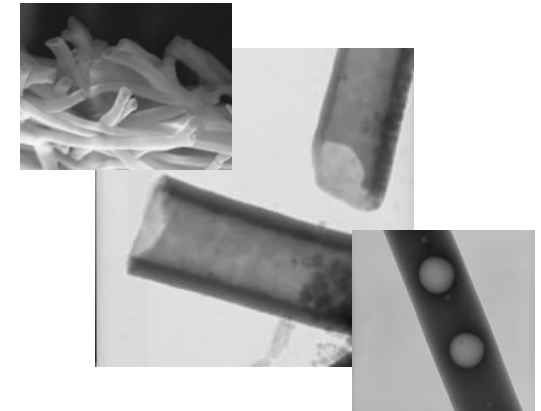
PLA



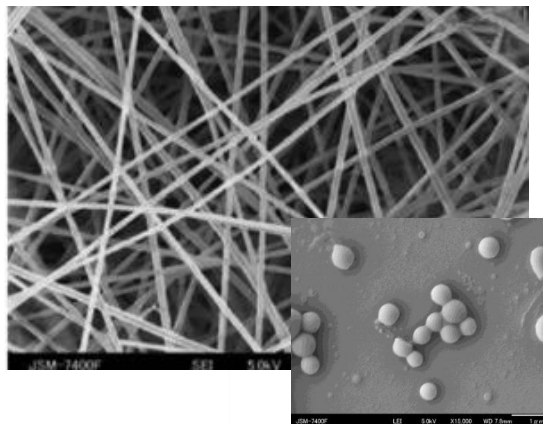
PVA



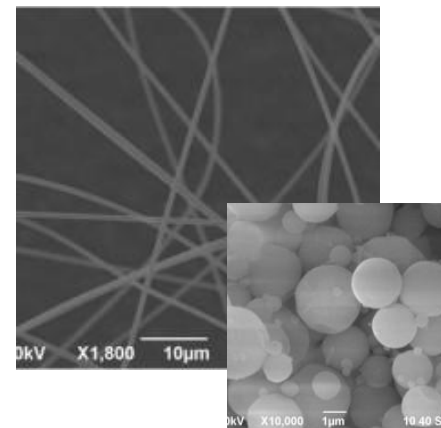
LIGNIN



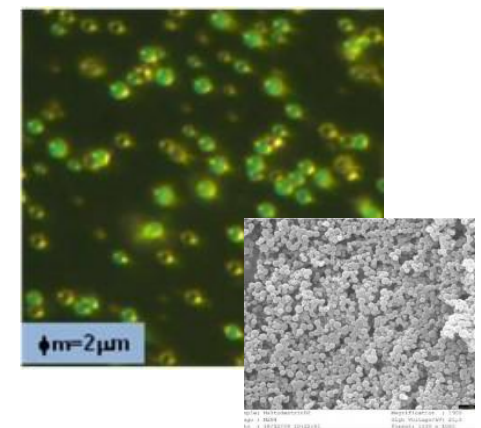
ZEIN



CELULLOSE



MALTODEXTRIN



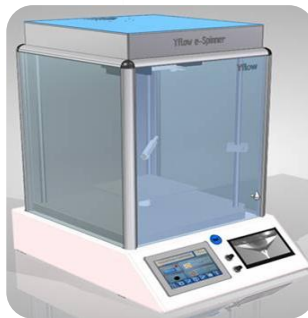
COLLABORATIONS

WITH WORLDWIDE ESTABLISHED COMPANIES



PRODUCTS

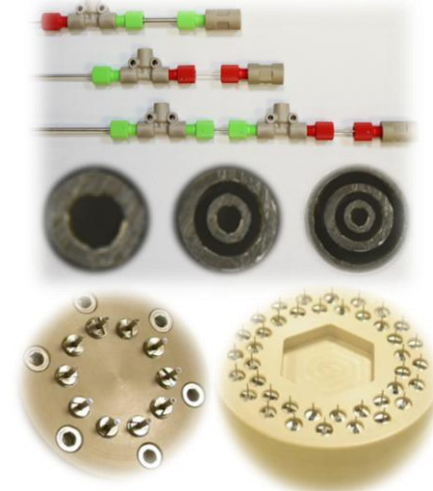
ELECTROSPINNING/ELECTROSPRAY LAB DEVICES



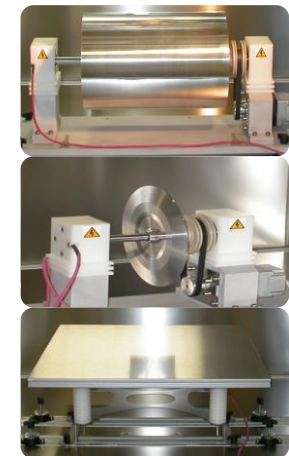
**START-UP
LAB UNIT**



**PROFESSIONAL
LAB UNIT**



INJECTORS



COLLECTORS

*“APPLICATIONS ARE ENDLESS
IMAGINATION IS THE LIMIT”*



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