



University of Central Florida

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Advanced Method in Monodisperse Micro Droplet Generation

UCF researchers have invented the Periodic Electrohydrodynamic (PEHD) Chopper, an apparatus that creates monodisperse (uniform) micro droplets with a wide range of diameters, from 10 micrometers to 500 micrometers. The PEHD Chopper can be used in filter testing, material processing, and precision liquid coatings for physical and chemical deposition. It can also be used as an atomizer for spray drying and spray pyrolysis of monodisperse micron-and-nanometer-sized fine chemical powders for pharmaceuticals, lithium-ion batteries, fuel cells, solid state lights, and other high-precision applications. The PEHD Chopper's design is simple and costs relatively less to manufacture and is easy to maintain, refill, and clean.

This method can disperse polar, nonpolar (e.g. heptane), and/or high viscosity liquids (>100 centipoise) with transverse periodic perturbations on micro liquid jets. Driven by AC signals, the fringe field of a capacitor creates PEHD stress which chops the liquid jet. When the driving signal nears 50% of the Rayleigh frequency, liquid jets display highly ordered break-up with a size relative standard deviation less than 1%. This method has a scalable chopping effect on multiple jets, requires no contact, and is non-intrusive, ensuring minimum contamination.

Technical Details

The invention consists of a liquid pump, a nozzle orifice, two perturbation electrodes, and a perturbation signal generator. The perturbation electrodes are closely positioned, sharp, electrically conductive objects (e.g. fine wires), sharp tips, or flat plates, mounted in a stacked formation with an insulating spacer between them. The stacked electrode-insulator-electrode configuration creates a capacitor with an intense fringe electric field. An AC function generator, with a variable output frequency between zero to several MHz, is connected between the electrodes and amplified using a signal amplifier. When the amplified signal is applied to the perturbation electrodes, an alternating electric field emanates from the edge of the electrodes, where the AC electric field imposes an electric stress gradient on the liquid, creating the chopping action.

UCF Inventors

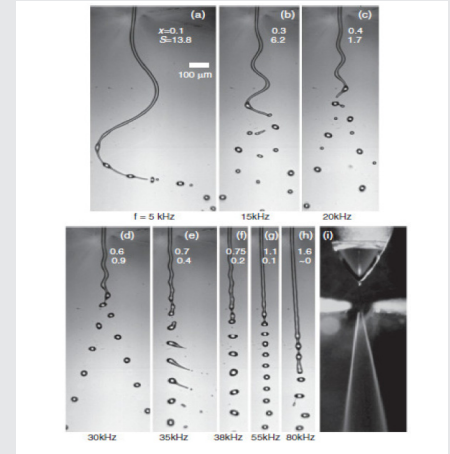
Weiwei Deng, Ph.D.; Hongxu Duan; Cheng Li; Weiwei Yang

Tech Fields

Microfluidics and Nanofluidics

Picture Caption

A typical response of an electrified liquid micro-jet in accordance with the embodiments to external transverse perturbation introduced by an AC electric field between a narrow gap interposed between two coplanar blade electrodes



Benefits

- Low cost to build
- Easy to maintain, refill, and clean
- Uniform droplet size
- Wide droplet size range from 10 micrometers to 500 micrometers

Applications

- Research
 - Aerosol
 - Photonic
 - Combustion
 - Biological
 - Medical
- Filter testing
- Material processing
- Precision liquid coatings for physical and chemical deposition

Keywords

monodisperse, uniform dispersion, micro droplets, nano droplets, droplet generation

Patent Pending

If you or your company are interested in this opportunity, Contact:

Raju Nagaiah | 407.882.0593 | Raju@ucf.edu | Tech ID# 32900

UCF Office of Technology Transfer | 12201 Research Parkway, Suite 501, Orlando, FL 32826