Hielscher Ultrasonics – Your Expert for Nanoemulsions

Hielscher ultrasonic homogenizers are very efficient for the size reduction and distribution of soft and hard particles. By intense cavitational forces, ultrasound reduces small particles (solids and liquids) in a liquid to improve uniformity and stability.

Ultrasonic Emulsifying

Emulsions are dispersions of two or more immiscible liquids. Highly intensive ultrasound supplies the power needed to disperse a liquid phase (dispersed phase) in small droplets in a second phase (continuous phase). In the dispersing zone, imploding cavitation bubbles cause intensive shock waves in the surrounding liquid and result in the formation of liquid jets of high liquid velocity. As ultrasonication can produce very small droplets of uniform size in batch and production process, ultrasound is an effective methods to create stable nano-emulsions.

Trusted and Tested Technology

Research and industry are using ultrasonic emulsification to develop and produce high-quality nano-emulsions.

Ask us for a free demo or sample treatment!

Advantages of Ultrasonic Nanoemulsification

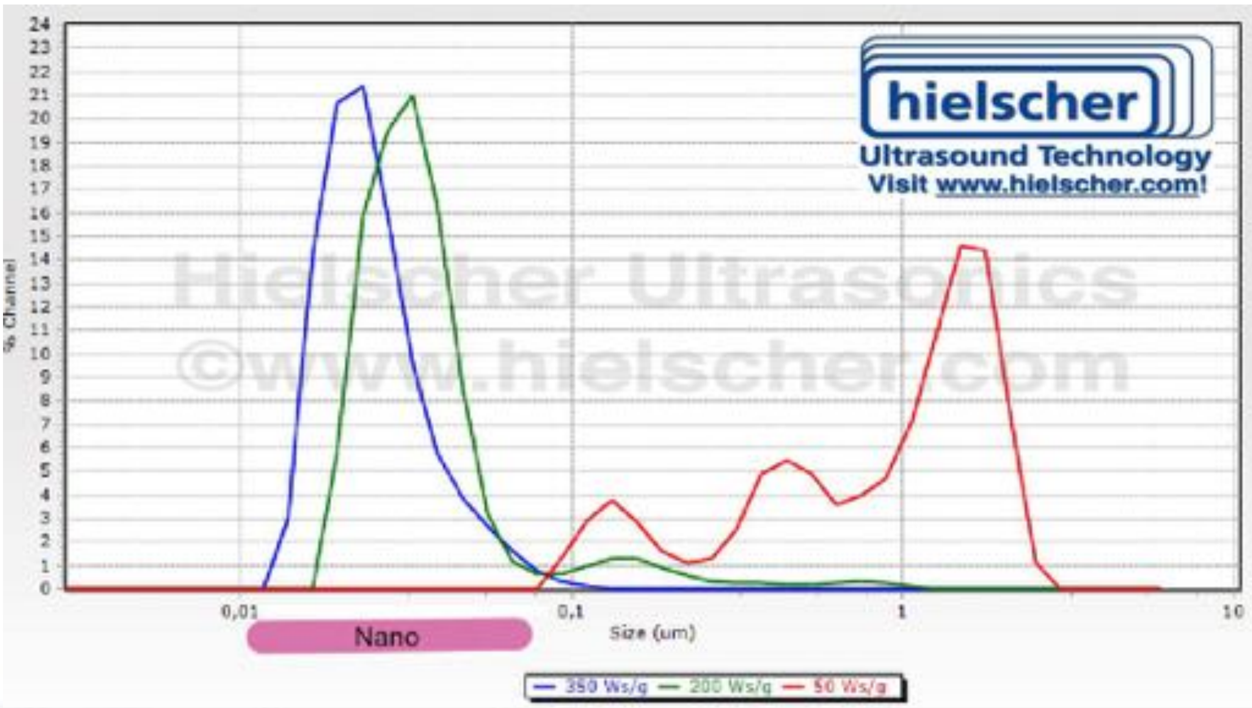
- **simple and rapid process**
- **stable, clear nanoemulsions**
- **high concentrations**
- **batch or inline**
- **linearly scalable from test to large volumes**
- **low cost**
- **low maintenance**
- **easy and safe to operate**

Nanoemulsions for Food & Pharma

Many vitamin and nutrients exhibit a low bioavailability when administered orally. Nanoemulsions are the solution to prepare highly bioavailable formulations containing vitamins or phytochemicals.

A prominent example is the cannabidiol (CBD) Being highly lipophilic, CBD has a very low oral bioavailability. To increase CBD bioavailability, cannabidiol can be formulated into a water-soluble nano-emulsion. Such nano-emulsions not only improves the CBD absorption, but also turns the CBD into a product that can be an easily solubilised into water-based formulations such as drinks, tinctures or lotions.

Ultrasonication allows allows to formulate **liposomes** and **micelles** (e.g., vitamin C, curcumin, quercitin, resveratrol etc.).



Ultrasonic Nanoemulsions - Benefits & Advantages

Comparison of Ultrasonics and HPH

	Ultrasonic Nano-Emulsificaton	High-Pressure Homogenization
Technique	Ultrasonic cavitation produces nano-droplets and nano-emulsions - **constant amplitudes** - **constant pressure** - **precise temperature** control - high reliability - reproducibility Ultrasonic emulsification allows for **continuous high-qualit**y product standards Unique add-ons such as the Hielscher MultiPhaseCavitator enhance the nano-emulsification process	High-pressure technology using nozzles/valves - sensitive valves - prone to clogging - not for high concentrations - not for abrasive particles - laborious cleaning and maintenance
Scalability	Ultrasonic emulsification can be run as **batch and inline** process - linear scalability - virtually no upper production limit - can easily produce large volumes of nano-emulsions in a rapid process	- low flexibility, many systems can be used only continuously or discontinuously - no linear scalability: for scale-up, larger valves are used. Losing the original valve geometry and shear profile means the process must be optimised again
Process Temperature	- precisely controllable - batch and flow cell can be **effectively cooled** - **pulse mode** and automatic temperature monitoring for temperature control - Hielscher ultrasonic devices are equipped with pluggable **temperature sensor** and automatic data protocoling	- no cooling during emulsification in the system, which might degrade the temperature-sensitive molecules
Safety & Maintenance	- easy and safe to operate - **low maintenance** - emulsification is a mild process, which means very low sonotrode wear - **low investment costs** - quality made in Germany	- high pressures - high maintenance - expensive in acquisition and operation

hielscher ultrasonics

Ultrasonicators for Nanoemulsions

Wether you need to prepare CBD nano-emulsions in smaller lots for customer-specified formulations or you want to produce large quantities of nano-emulsions for a broad market, Hielscher Ultrasonics offers you a sophisticated ultrasonic setup for your nano-emulsion production.

Advantages of Hielscher Ultrasonicators

From Small to Large Quantities

Hielscher ultrasonic emulsifying equipment is available for small
A huge advantage is the flexibility to use all Hielscher systems for **batch and inline** emulsification.

Automatic Data Protocoling

Equipped with a color touch display, browser remote control and integrated SD-card for automatic data recording, Hielscher ultrasonicators are designed for sophisticated sonication and reproducible results. The intelligent software records date, time, amplitude, net and total energy, temperature and pressure (when the pluggable temperature and pressure sensors are used). This allows for process standardisation and continuous product quality!
Hielscher Ultrasonics allows for **precise control** over
- amplitude
- energy input (i.e. determine a specific energy input, i.e. limit Ws)
- temperature
- pressure

→ **This enables for exact process control.**

UP400St - 400W ultrasonicator

UIP4000hdT - 4000W ultrasonicator

ultrasonic emulsification for batch and inline processing from small to large volumes