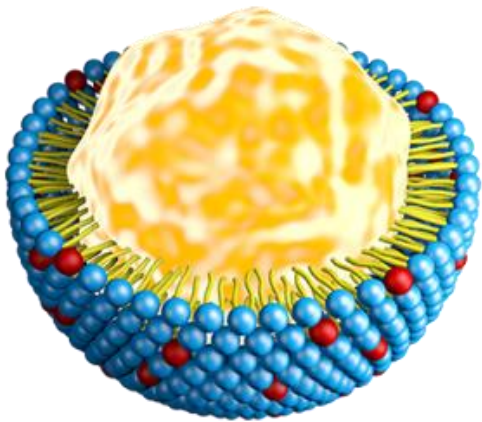


# Nanoemulsion

Nanoemulsions provides advantage for extract oil and active ingredients with low bioavailability by:


- ① Increasing bioavailability and reducing response time, dose and adverse effects
- ② Masking the taste of the extract oil
- ③ Producing translucent droplet sizes less than 100nm

An emulsion is a biphasic system in which one phase is dispersed in the other phase in the form of minute droplets with diameter up to 100 $\mu$ m. A nanoemulsion is colloidal dispersion form including oil and surfactant that can potentially improve the bioavailability of active agents. Along with main excipients nanoemulsions can also include membrane stabilizer, co-emulsifier, taste-blocker, pH modifier, osmotic adjuster and anti-oxidant. The droplet size of nanoemulsions fall typically in the range 20-200 nm. Due to small size, nanoemulsions are transparent.




## A structure of Nanoemulsion



Organic surfactant 

Oil or active ingredient

Co-emulsifier 

possible excipient includes membrane stabilizer, taste-blocker, anti-oxidant

The four steps of nanoemulsion preparation are:

- ① mixing emulsifier and oil with a stirrer;
- ② homogenizing to nanoemulsions;
- ③ sterilization by filtration at 0.22 $\mu$ m;
- ④ quality analysis by particle sizer.

Genizer provides solution for nanoemulsions, suitable for batch preparation from 25mL to 10L, or continuous manufacturing from 10mL/min to 20L/hour.

The full set of NanoEmulsion Systems including:

- ① NanoEmulx: Natural Emulsifier for nanoemulsions
- ② NanoGenizer: Prepare the nanoemulsions by creating nano particle size
- ③ Sterile Filter: Stainless online sterile filtration with 0.22 $\mu$ m size
- ④ Nano Particle Sizer: Measure the nanometer with dynamic light scattering



Equipment Name	Capacity	Function
NanoGenizer	20mL-5L	Homogenizing of nanoemulsions
NanoGenizer-Dual	50mL-10L	Homogenizing of nanoemulsions
PilotGenizer	200mL-30L	Homogenizing of nanoemulsions
PilotGenizer-Dual	200mL-50L	Homogenizing of nanoemulsions



**Inline Sterile Filter**



**Nanoparticle Analyzer**

Equipment Name	Capacity	Function
47mm Sterile inline filter	20mL-2L	Sterile filter for the nanoemulsions
90mm Sterile inline filter	50mL-10L	Sterile filter for the nanoemulsions
142mm Sterile inline filter	200mL-50L	Sterile filter for the nanoemulsions
<b>Nanoparticle sizer Dual</b>	<b>1nm-10µm</b>	<b>Analyzing the size of nanoemulsions</b>

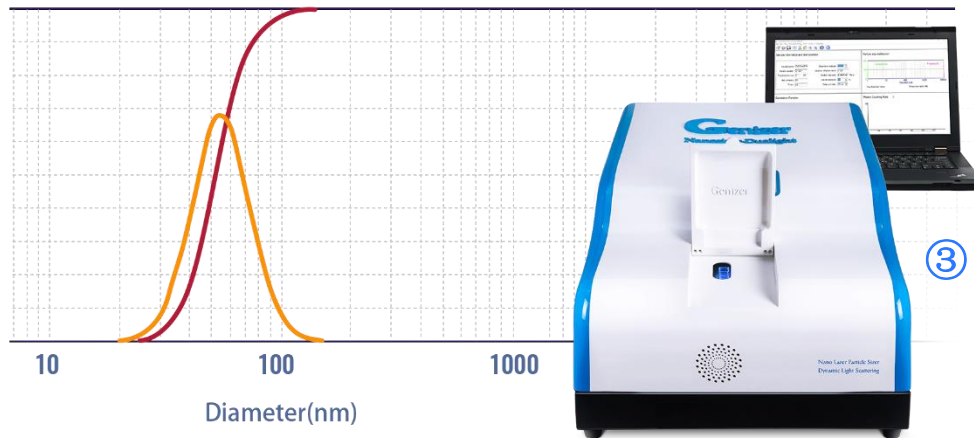


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## Solution for Nanoemulsions



- ① High-Pressure Homogenizer
- ② Sterile Filter
- ③ Nanoparticle Analyzer



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## Recommendation for Nanoemulsions

Batch	Recommendation
20mL-5L	NanoGenizer; 47mm sterile inline filter; Dual Nanoparticle sizer
20mL-5L	NanoGenizer; 90mm sterile inline filter; Dual Nanoparticle sizer
20mL-10L	NanoGenizer Dual; 90mm sterile inline filter; Dual Nanoparticle sizer
20mL-30L	PilotGenizer; 142mm sterile inline filter; Dual Nanoparticle sizer
20mL-50L	PilotGenizer Dual; 142mm sterile inline filter; Dual Nanoparticle sizer
>50L	Please request quote

While sonication is effective for small batch nanoemulsions, it is not especially suitable for processing large quantities of certain types of tissues.

The NanoGenizer, a high-pressure homogenizer, is able to produce nanoemulsions with the combined forces of microfluidization and shear. NanoGenizer maximizes particle reduction, speeds up processing and lowers the time and overall cost of production.

Not only can high-pressure homogenizers be used for large batches production of nanoemulsions, they can be set up as part of an inline process, allowing mixing, homogenization, sterilization of large volumes of nanoemulsions without interruption.

Genizer offers the NanoGenizer high-pressure homogenizer for preparation and online sterile filtering for sterilization of nanoemulsions without interruption. In addition, Genizer also provide the light scattering particle sizer for measuring the size of nanoemulsions.



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## Nanoemulsion by NanoGenizer V.S. Sonication and High-Speed Shear



Description	NanoGenizer	ultrasound Sonication	High Speed Shear
Scalability	✓	✗	✗
Strength	✓✓✓	✓	✓
Constant	✓✓✓	✓	✓
Particle Size	✓✓✓	✓	✓
No Metal Contamination	✓✓✓	✗	✓
Continuous	✓	✗	✗
Online to sterile filter	✓	✗	✗
Temperature Control	✓✓✓	✓	✓

How to formulate the nanoemulsions? Mixing an emulsifier with an oil using a stirrer, homogenizing the sample, sterilizing it and measuring it.

How to homogenize the nanoemulsions? Homogenizer nanoemulsions by putting them through a homogenizer like NanoGenizer.

How to sterilization of the nanoemulsions? Using a sterile filter at size .22µm.

How to measure the size of nanoemulsions? Using a light scattering particle sizer

