

# Primary Differences Between Nanoemulsions and Nanoparticles

By Dr. Harold Han

*Abstract:*

*In recent years, advances in nanoemulsion technology have led to an upsurge of its usage within products of both the food and cosmetic industries. In addition, the cannabis industry is currently adopting nanoemulsion technology to transform hydrophobic cannabinoid molecules into water compatible material. Industry brands and consumers often interchange the unique terms of nanoemulsion and nanoparticle, leading to a misconception of their distinct respective properties' and safety concerns. The goal of this white paper is to define the difference between nanoemulsion and nanoparticle. All information herein is supported by peer-reviewed literatures.*

## I. DISCUSSION

To begin, it is imperative to understand the differences between an *emulsion* and a *particle*.

**An *Emulsion* is a system that contains two immiscible liquids.** For example, milk is an emulsion. It contains a core made with fat which is surrounded by water. The fat and water are both in liquid form, thus it can be easily consumed and digested.

**A *Particle* is a rigid sphere; the core material is solid which determines its main property.** For example, Titanium Dioxide particles have a solid core made from TiO<sub>2</sub> and they are being used in the sunscreen for titanium's photocatalyst property.

The only shared primary characteristic between a nanoemulsion and a nanoparticle is their sizing; their diameters are both smaller than 100nm. Other than that, their composition, general physical properties, and safety for human consumption are drastically different. Many published scientific literatures have compared the differences between the two materials<sup>1,2,3</sup>. Table 1 summarizes their primary differences.

	<b>Nanoemulsion</b>	<b>Nanoparticle</b>
<b>Core material</b>	liquid soft deformable organic	solid hard rigid in-organic
<b>Biological fate in humans</b>	soluble digestible bio-degradable	insoluble non-digestible bio-persistent

Table 1. Major differences between nanoemulsion and nanoparticle

## II. CONCLUSION

As indicated above, nanoparticles are non-digestible and as such are slowly excreted from the human body. Additionally, the extremely small size of nanoparticles can allow unsafe levels of accumulation in certain organs, posing a potential health risk.

However, nanoemulsions utilize surfactants that are comprised of common food substances approved for human consumption and are "Generally Recognized as Safe" (GRAS) by the U.S. Food and Drug Administration<sup>4,5</sup>.

<sup>1</sup> Critical reviews in food science and nutrition., 2011, 51, 285

<sup>2</sup> Food science and technology., 2014, 59, 1, 115

<sup>3</sup> RSC Advances., 2017, 7, 40053

<sup>4</sup> Journal of Biomaterials and Nanobiotechnology., 2011, 2, 626

<sup>5</sup> Food Engineering Reviews., 2013, 5, 3, 139