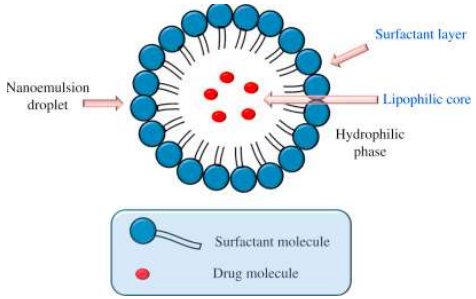
Applications of nanoemulsion technology in food industry

Author- Ashwin Rajesh Student ID- 22047901
NF7064- Advanced research skills, School of Human Sciences

LONDON METROPOLITAN UNIVERSITY

Introduction

Emulsions are formed when immiscible liquids go through processing to form a homogenous structure. Nanoemulsions have droplet size in nanometer range.

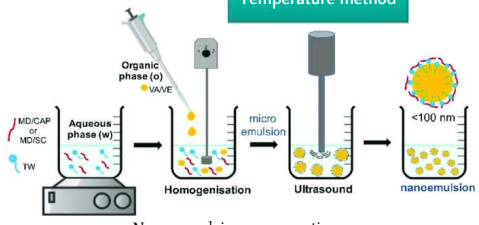


The properties vary according to the type and composition of the nanoemulsion.
Nanoemulsion technology is an in-development technology with undergoing researches for its applications (Singh, 2023).

Materials and Methods

There exists a plethora of diverse methodologies for the production of nanoemulsions, characterized by composition, efficacy and applicability across various industrial sectors (Sneha and Kumar, 2022).
Some of these methods are-

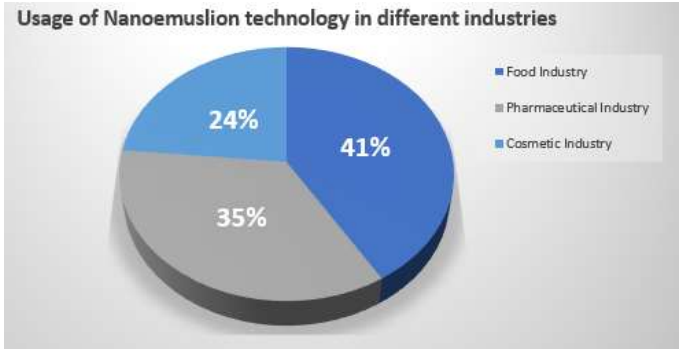
- High pressure Homogenization
- Ultrasonication
- Micro-fluidization
- Surfactant assisted methods
- Phase Inversion Temperature method



Nanoemulsion preparation

Results

Beyond their established role in the food industry, nanoemulsions find growing applications across diverse sectors, including cosmetics and pharmaceuticals. Prominent contribution in applications of nanoemulsion technology is the food industry sector due to various applications in different unit operations whereas in pharmaceutical industry the most common application is for targeted drug delivery (Patel, Patel and Thakore, 2018).



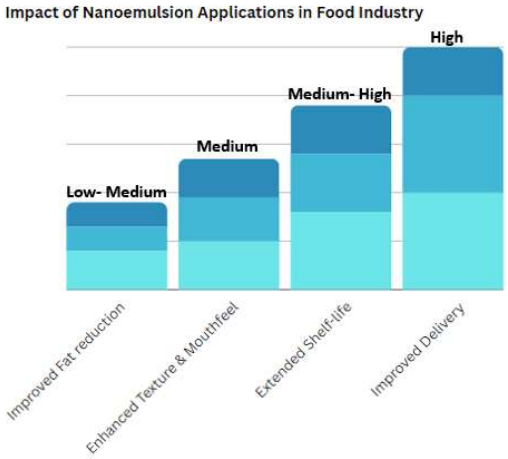
Cosmetic industries have a significant use of this technology for controlled release of active elements which is also a key factor of usage in healthy food production which contain bioactive compounds (Ozogul, 2022).

Discussion

Food industry is being directed towards health focused and nutraceutical aspect as consumer awareness is increasing. Consumers demand integrated supplements in their food and for nutrients like Vitamin A, D and different types of enzymes are delivered using nanoencapsulation technology as it is the most efficient for bioavailability in the human body (Mujica-Álvarez et al., 2020)

Capsules having similar structure to nanoemulsions

Nanoemulsions are effective carriers for flavouring and aromatic compounds which directly have a positive impact on the sensory attributes.
In the food packaging industry nanoemulsions are incorporated in the biopolymer matrixes to produce stable biodegradable hence sustainable alternatives (Espitia, Fuenmayor and Otoni, 2019).



Conclusion

Nanoemulsion technology is an emerging technology and is in the process of continuous research and development and has potential for increasing the efficiency of many methods by increasing the dissolving accuracy, enriching the bioavailability and stability. Nutraceutical industry has already adapted this technology for their functional ingredients and fortification. There are many different methods for production of nanoemulsions some are cost effective and some create for stable systems.

They have potential to transform sustainable packaging prospect in food industry . One of the challenges is to check the compatibility of the individual components to create a stable nanoemulsion and compatibility of the emulsion in the chemical environment of food system.
This technology is revolutionizing low-fat products without the need for over processing and also extending the shelf life of spoilage-prone foods.

In conclusion Nanoemulsion and nanoencapsulation have a promising future in the food industry with various benefits in

- Nutrition
- Sensory
- Packaging

The applications are not limited to food industry but are applications are also being developed in the pharmaceutical and cosmetic industry.

References

Espitia, P.J., Fuenmayor, C.A. and Otoni, C.G., 2019. Nanoemulsions: Synthesis, characterization, and application in bio-based active food packaging. Comprehensive Reviews in Food Science and Food Safety, 18(1), pp.264-285.

Mujica-Álvarez, J., Gil-Castell, O., Barra, P.A., Ribes-Greus, A., Bustos, R., Faccini, M. and Matiacevich, S., 2020. Encapsulation of vitamins A and E as spray-dried additives for the feed industry. Molecules, 25(6), p.1357.

Ozogul, Y., Karsli, G.T., Durmuş, M., Yazgan, H., Oztop, H.M., McClements, D.J. and Ozogul, F., 2022. Recent developments in industrial applications of nanoemulsions. Advances in Colloid and Interface Science, 304, p.102685.

Patel, M.R., Patel, R.B. and Thakore, S.D., 2018. Nanoemulsion in drug delivery. In Applications of nanocomposite materials in drug delivery (pp. 667-700). Woodhead Publishing.

Singh, H., 2023. Scope of nanoemulsions in food industry: A review
.

Sneha, K. and Kumar, A., 2022. Nanoemulsions: Techniques for the preparation and the recent advances in their food applications. Innovative Food Science & Emerging Technologies, 76, p.102914.