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Perspective

Bio-engineering principles to modulate the functionality of proteins in food systems

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DESCRIPTION

Proteins are incredibly adaptable macromolecules that perform a wide range of tasks such as catalysis, scaffolding, transportation, and membrane functions, and are thus regarded as essential components of biological systems. Protein engineering is a biotechnological technology that allows scientists to create novel protein structures to improve biological functions. It may be used to improve the functioning and nutrition of a variety of foods. Designer meals rely heavily on protein engineering to attain desired nutritional and technical properties. Several ways have been explored to create proteins with predicted novel functions or enhanced native behavior based on a better understanding of the structure-function connection. The use of colloidal structures to stabilize emulsions is a contemporary trend in the food and pharmaceutical sectors. Complexes generated by bio-compounds including protein, polysaccharides, and phenolic compounds have the potential to provide physical stability to emulsions in addition to important functional features like oxidation resistance and thermal stability.

The synergy between bio mimicry and additive manufacturing is best described as beautiful and functional; the perfect combination of nature's beauty and engineering functionality. Nature has shown to be a significant source of design inspiration. Major gaps between the biological and engineering domains prohibit bio mimicry from reaching its full potential. Biomimetic structures potential contribution to additive manufacturing technical growth through new products and applications. Rapid population expansion along with improved nutrition awareness has fueled demand for organic acids and proteins in pharmaceutical and food products during the last few decades. Separation cost techniques in the synthesis of organic acids and proteins contribute to the overall of production. Electrochemically-mediated separations have recently attracted a lot of interest as a long-term option for reducing chemical use and increasing process efficiency. Plant proteins have interesting technical and functional qualities that can be exploited to create new protein systems. Following worldwide environmental policy demands, green and high-pressure processing is gaining traction. These technologies have shown that they can change the structure of proteins and hence their function, bringing up new opportunities for the creation of functional food systems. Alternative protein sources, postharvest engineering for food waste transformation and sustainability are all part of a worldwide perspective of bio systems engineering solutions for developed countries. Advancements in food processing technology such refrigeration, freezing, thermal and non-thermal processing, and drying. Extrusion for alternative ingredient production and innovative texturization, 3D food printing for personalized structuring and nutrition, pulsed electric field or hydrostatic pressure for structuring, precision fermentation and other methods for bioactive incorporation. Plant-based diets are gaining popularity as a way to strike a balance between human health and environmental sustainability. Vegetables or fruits are used as the primary raw ingredients in plant-based fermented cuisine. The finished products are then converted by microbes and their metabolites, which are commonly coated by biofilms throughout manufacture and storage. Biofilms are made up of a variety of microbial flora and extracellular compounds created during fermentation, which is typically thought to be a flaw in the process. However, these complex microbial communities are sources of both probiotic and antimicrobial chemicals that might improve food processing and health. Super wettability is a type of wettability that has lately been linked to a slew of technical advancements. Many artificial super wettability systems are now being built bio mimetically, with hierarchical micro nano structures playing a key role. There are numerous

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methods for creating super non wettable surfaces, all of which attempt to create surface micro-protrusions with a specified average distance and aspect ratio, which are where nanoscale roughness is found. Templating, layer-by-layer assembly, electro spinning, plasma treatment, etching, lithography, the sol–gel technique, and coating are the most prevalent forms of these processes. Two key measures are made to evaluate super wettability systems and hysteresis. The development of super wettability strategies in food engineering and they may be divided into two categories

• Super wettability is a property related with solid liquid interfaces that might be useful in food packing, food coating, food processing equipment, and liquid separation.

• Food grade super wetting agents for colloidal systems.

Due to its potential applications in the food industry, such as self-cleaning, anti-fogging, anti-icing, anti-bacterial action, anti-fouling, fluidic drag reduction, anti-corrosion, oil–water separation, and super wettability-based systems have recently gained a lot of interest. The super wettability method may play a significant role in food processing and preservation in the future.