NANO-STRUCTURE AND NANOTECHNOLOGY APPLIED TO FOOD INDUSTRY PROCESSES AND ENGINEERING EQUIPMENT

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Abstract

In this paper some advantages of applying nano-structure and nanotechnology to food industry have been presented. Nowadays, it has been observed enormous material engineering development mainly at the nano scale with valuable input to general sciences and industries. With respect to that its became also necessary to concentrate more deeply on the nano-structure and nanotechnology, to estimate and evaluate their influence on food industry and their possible useful application in variety of unit operation as well as to the more smaller, durable and effective parts in many manufactured processing equipment [1].

There are two crucial area that have been considered for nano-structure including nano particles and nanotechnology when used in food engineering. The first one contain many nano-structured materials including porous and corundum ceramics. In this case possible application have been presented and their effectiveness calculated. To that area belong the following: filtration process with nano-filters, nano-structure with special function like membranes, nano-pipes, nano-sensors and biological-sensors, special surfaces coated and deposited with properly oriented nano-particles having increased surface wettability and improved capillarity effects; many types of bearings, dispersion together with aeration and atomisation processes with different nano-particles sizes, changes of surface roughness parameters of material plates, and their relationship between value of adhesive force and its changes with time duration contact and temperature. The second one is nanotechnology. In this case special attention should focused on the heat and mass exchange in many unit processes where basic results are related to heat transfer technology. In can be very useful in the equipment of the renewable energy and during waste treatment and saving surroundings. Within that area many examples have been considered, Namely: saving unit processes energy, saving and reduction of waste, reduction part of heat from food industry production plant influencing on global warming effects, improving effectiveness of dispersion and adsorption processes in many branches of food industry, aeration in O_2 and dissolution of ozone and its delivery in the CIP processes, improving combustion and gasification in waste utilization processes, in diffusion and granulation processes, capsule seeds with nano-envelope, break up with nano-metric sizes, in milk powder production, and many others.

In conclusion it have been stated that at this area there are also very big space for theoretical and experimental work to develop promising nano-materials, to make nano-structure solid-state devices smaller and more efficient in the equipment manufactured for food engineering. There are also expected results of novel membrane for water filtration with lower energy consumption than that of reverse osmosis processes, for a similar retention of viruses and micro-pollutants. The present achievements and nano-fluids results may change many existing rules and low in heat transfer technology.

Key words: *Nano-filters, Nano-sensors, Nano-fluids, Heat and mass transfer, Energy consumption.*