Nanotechnology in food and packaging materials

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The prospects for applications of nanotechnology to the food sector have become more apparent over the last few years. Nanotechnology applications are expected to bring changes to the food sector, including improved production and processing techniques, improved food contact materials, modification of taste, texture and sensation, monitoring food quality and freshness, reduced fat content, enhanced nutrient absorption, and improved traceability and security of food products. The number of companies undertaking research and/or using nanotechnology for food applications has been estimated to be between 200 and 400. These almost certainly include some of the major international food and beverage firms. However, it is difficult to gauge the accurate level of commercial activities in this area. Due to reasons such as the absence of a legally binding definition of engineered nanomaterials and difficulties to identify and characterize these materials in a food matrix it is even more difficult to differentiate 'real' nano products from those only claimed to be nano products.

Despite the current uncertainties, the market for nanotechnology-derived products for the food sector is predicted to grow rapidly in the coming years. The overall size of the global market in 2006 has been estimated at between 140 million and 7 billion US Dollars. Future estimates vary between 5.8 billion US Dollars in 2012 to 20.4 billion US Dollars by 2010. A variety of food ingredients, additives, encapsulation systems and food contact materials is already available in some countries. Among them, nanotechnology-derived packaging (including food packaging) make up the largest share of the current and short-term predicted nanofood market. However, virtually all known applications of nanotechnology in food and food packaging are currently outside the EU, mainly in the USA, Japan, China, Australia, New Zealand, South Korea, Taiwan, and Israel. However, virtually all of the currently available nanotechnology-derived consumer products can be bought by the consumer via the internet anywhere in the world.

Broadly, the following categories of nanotechnology applications in the food sector have been identified:

1) The use of nanotechnology processes or materials to develop food contact materials. This category includes nanofilters, material for food

packaging and coatings for kitchen utensils, processing equipment, and food containers.
2) Nano-sized, nano-encapsulated or engineered nanoparticle ingredients including bioactive compounds, nutrients, additives and processing aids.
3) Food ingredients that have been processed or formulated to form nanostructures and nanotextures for example to alter taste, texture, and consistency of food products.
4) Biosensors for monitoring conditions of food during storage and transportation including packaging with integrated indicators.