

A SMART INDICATOR TO BOOST FROZEN FOOD SAFETY

Relevant for: Science & Technology | Topic: Nanotechnology

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The temperature at which food products are stored is vital in ensuring their quality. For example, in retail outlets across India, power failure and repeated opening and closing of freezer storage units in which food products are stored can lead to temperature fluctuations. These in turn can affect the quality of food, especially perishable food, leading to microbial growth. Temperature fluctuations can also affect vaccines and drugs that are stored in cold storage or at below room temperature.

Researchers from the Indian Council of Agricultural Research-Central Institute of Fisheries Technology (ICAR-CIFT), Kochi, Kerala, in collaboration with the University of Wisconsin, Madison, U.S., have now found a way using gold nanoparticles that they synthesised to help tell if frozen food is still edible.

The nanoparticles change colour in response to changes in temperature. They become ruby red (similar to the colour of red wine) at -18°C and turn purple when the temperature rises. At room temperature, their colour is dark grey.

To synthesise the nanoparticles, the researchers used chitosan, a natural biodegradable polysaccharide that was extracted from marine waste such as shrimp and crab shell. A solution of chitosan and gold chloride solution was heated for about 30 minutes at 90°C . Though the sample preparation process was simple, care was taken to maintain proper conditions such as temperature, stirring and base concentration of the gold solution.

The nanoparticles remained stable when tested at -18°C . Their colour and other physical properties remained intact even at the end of 30 days of testing at -18°C .

Explains Dr. C.O. Mohan, Senior Scientist, ICAR-CIFT, Kochi and corresponding author of the work that has been published in *npj Science of Food*, "The colour change of the nanoparticles is irreversible. So once they change from red to purple or grey when the temperature increases, the original colour cannot be regained even if the temperature is brought back to -18°C ." He adds, "They can be attached to the outer surface of the food or pharmaceutical packs as a visible indicator without coming in contact with the product."

According to him, such smart indicators can be made using a very small quantity of chitosan-gold nanoparticle solution to identify frozen temperature abuse. It would cost less than 2 a pack. The team is also working to develop smart indicators from nanoparticles of other metals to further reduce the cost.

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