

CARBON-BASED NON-TOXIC AND REUSABLE WRAPPER TO INCREASE SHELF LIFE OF FRUITS

Relevant for: Science & Technology | Topic: Indigenization of technology and developing new technology

Indian scientists have developed a composite paper made of carbon (graphene oxide) loaded with preservatives that can be used as wrappers to help extend shelf life of fruits. Unlike the present preservative dipping technology, where the preservatives are adsorbed by the fruit, causing chronic toxicity to the consumers; here preservatives the wrapper releases the preservative only when needed. The wrapper can be reused, which is not possible with the present technology.

Fruits are highly perishable, hence 50% of fruits produced are wasted, causing huge losses. Conventional preservation relies on coating the preservative with the resin, wax, or edible polymer, which may cause chronic health problems.

In order to address this problem, a team of researchers led by Dr. P. S Vijayakumar from Institute of Nano Science and Technology, Mohali, an Autonomous Institute of the Department of Science and Technology, Ministry of Science and Technology, Government of India looked for an alternative, that could be generated from waste and would not lead to adsorption of preservatives in the fruit.

The activated graphene oxide-loaded molecules were then loaded with preservatives. This high preservative-loaded graphene oxide, when cast into a paper used for fruit wrapping, ensures that the fruit is not loaded with toxic preservatives. But when the fruit over-ripens or gets infested by pathogens, the acidity increases by the secretion of acids, citric, and oxalic acids trigger the release of the preservatives for the preservation of the fruit. Otherwise, the preservative stays with the carbon wrapper. In the fruit dipping method, the preservative will be lost along with the fruit, whereas the wrapper can be re-used after the consumption of the fruit for the preservation of the next batch of fruits.

To develop this non-toxic and reusable wrapping paper, the team allowed carbon matrix to incubate with the preservative. After the incubation for 24 hr in room temperature, the resultant was washed several times to remove the extra preservatives. And finally, this carbon-preservative composite was cast into paper. *This work has been published in the journal 'ACS applied materials and interface'.*

“Already waste-derived carbon materials are known to harbour huge amount of organic molecule loading, hence the preservative loaded carbon has been prepared and cast into paper for the fruit preservation. Increasing the capacity of carbon to hold organic molecules helped us to develop this product,” adds Dr. Vijayakumar.

This novel product can benefit the farmers and food industry by extending the shelf life of fruits. Using this wrapper for the fruit will also ensure that the customer gets the fruits with healthy quality, as we have found improvement in the phenol content. The production of this graphene fruit wrapper requires only the carbon produced from the heating of biomass, hence it will also benefit in biomass consumption and employment generation.



Publication details:

Sharma S. B.; Biswal K.; Kumari D.; Pulkit Kumar, S.; Stobdan T. and Vijayakumar P. S.*Eco-friendly Fruit Switches: Graphene Oxide-Based Wrapper for Programmed Fruit Preservative Delivery To Extend Shelf Life. *ACS applied materials and interface*. 2018, 10, 18478–18488.

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