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Title:Silk-based conformal, adhesive, edible food sensors
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Abstract:The paper presents a concept for making wireless passive antennas on silk substrates across multiple regions (MHz, GHz, THz) of the electromagnetic spectrum. These antennas can be easily applied to curved objects (i.e., food in this work) and adhere conformally. The devices were tested for function by monitoring their resonant responses continuously during the spoilage process to assess the potential to monitor changes in food quality. Proof-of-principle demonstrations for this type of approach are demonstrated by monitoring fruit ripening with a conformally attached RFID-like silk sensor transferred onto the fruit skin, and spoilage of dairy products through surface contact (in the solid case) or immersion (for liquid goods). These types of passive, chip-less sensor, consists of an antenna or an array of antennas/resonators made of only a sub-micron thickness of gold, a level equivalent to common edible gold leaf/ flakes used on cakes and chocolates. The resonators are fabricated on pure-protein silk film substrates, and can be used as sensing platforms that safely interface with consumable goods or can be in direct contact with food (and can potentially be consumed) for different applications.
Number of references:32
Inspec controlled terms:agricultural products - antennas - bioMEMS - biosensors - chemical sensors - food products - food safety - gold - micromechanical resonators - microsensors - proteins
Uncontrolled terms:silk based conformal sensor - edible food sensor - adhesive sensor - wireless passive antennas - silk substrate - curved object - functional testing - resonant response - spoilage process - food quality change - fruit ripening - RFID like silk sensor - fruit skin - food spoilage - dairy products - surface contact - passive sensor - chipless sensor - edible gold leaf - antenna

resonator - pure protein silk film substrate - Au

Inspec classification codes:A8280T Chemical sensors - A8780B Biosensors - A0710C Micromechanical devices and systems - B7230L Chemical sensors - B7230M Microsensors - B2575D Design and modelling of micromechanical devices - B2575F Fabrication of micromechanical devices - B5270B Single antennas - B5270D Antenna arrays - B7230J Biosensors

Chemical indexing:Au/int Au/el

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Discipline:Physics (A); Electrical/Electronic engineering (B)

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