INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 5, Issue 3)
Available online at: www.ijariit.com

Food spoilage decay monitoring using RF technology

Mahantesh S. Hiremath
mahantthewise15@gmail.com
R V College of Engineering, Bengaluru, Karnataka

Rajani Katiyar
rajanikatiyar@rvce.edu.in
R V College of Engineering, Bengaluru, Karnataka

Dr. Naveen C. S.
naveen@inmtechnologies.com
INM Technologies Pvt Ltd, Bengaluru, Karnataka

ABSTRACT

Food industry has today become more oriented towards customer and requires quick response system. Electronic systems help in minimizing the unsafe production and distribution of food products. Currently the food labelling systems do not guarantee the good quality and safeness of the food. Hence, traceability is a tool applied to assist for assuring of food safety and its quality. We have used Active RFID system for the traceability, the communication protocol of Active RFID has been carefully designed. Energy efficient protocol has been developed and its aggregated throughput, delay and evaluation of the number of collisions happening in the radio channels is done and compared to the existing protocols, commercially available for Active RFID. In case of Marine food monitoring the TMA (trimethylamine) gas is liberated when the marine food starts to decay, using this liberated TMA gas as one of the parameters we determine freshness of food. In this paper it is also discussed about the designing and developing of the TMA (trimethylamine) sensor which can operate at normal room temperature.

Keywords— *Active RFID, Communication protocol, TMA*

1. INTRODUCTION

Food is the basic need for our society and monitoring food is one of the important aspects of food industry. Today there is a huge demand for Marine food and the monitoring system of Marine food is recruited all over the world. The important issues concerning many countries today is the accumulation and distribution of Marine food. In the recent years the global aquaculture reached new heights, to a peak of Ninety million tons. Market forces are driving the Marine food culture over the recent decades. Europe constitutes Eighteen per cent of Marine food and other continents constitutes a mere fifteen percent [1]. The exports of Marine food are being adversely affected by the minimum requirement of maintaining hygiene and quality conditions. Quality assurance in the Marine food sector involves monitoring and documenting defined quality criteria as required by regulations of different importing countries, product specifications and consumer demands. In maintaining the quality and safety of the Marine food items the RFID based system of monitoring and traceability plays an important role. Indian Marine Food Industry is a major producer and distributer in the 'International Marine food trade' and supplying 'variety of Marine food products'. India is second major producer of Marine food in the world producing seven percent of the total world production [2]. Indian quality has been broadly accepted in the global Marine food industry as the advanced changes take place in the rules and regulations of food market. Today there is a huge demand and information regarding the traceability and food quality of the Marine food items by the commercial marine food industries

1.1 RFID sensor node design

The design consists of embedded active RFID sensor node capable of detecting fish spoilage using TMA gas concentration and transmitting sensory data using GFSK modulation. The sensor node is a part of the RFID container system prototype. The system prototype performance is evaluated inside a container wireless channel. The system includes and is designed with an energy efficient protocol, power down mode, packet validation management, and sensory data logging capability. The design basically implements an RFID and a TMA sensor combination to work and provide the sensor data next to the reader. The reader analyses the sensor data and forwards it to the Main unit. The Main unit based on the various parameters determines the freshness of the marine food.

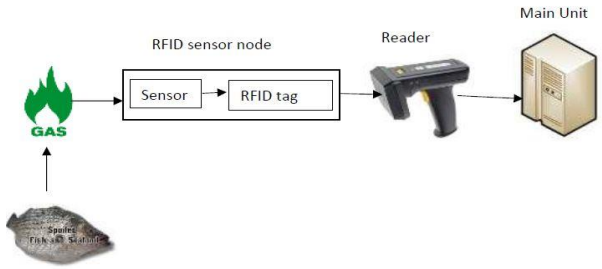

Fig. 1: Schematic diagram of the RFID system for fish spoilage detection

2. TMA SENSOR DESIGN

TMA Sensor is mainly used to sense the TMA (Trimethylamine) gas present in the air and indicates the concentration of the gas in PPM. There are many technologies for fish freshness determination based on visible light spectroscopy, electrical properties, image analysis, color, electronic noses, etc. Volatile

compounds measurement is one of the vital methods to determinate fish freshness. Many volatile compounds contribute to fish odor such as ammonia, trimethylamine (TMA), hydrogen sulphide and methylmercaptan, etc. TMA is an effective indicator for freshness of fish which may accelerate the decomposition of trimethyl-N-oxide in fish after death.

Preparation of nanocomposite of ZnO-SnO2 is an important aspect, 0.4M of powder zinc ziolite and 50ml of potash solution is taken in a beaker. Zinc ziolite powder is added to the potash solution in the beaker and solution is stirred for about one minute, similarly 0.6M of tin hexahydrate in 50ml of the potash solution in a separate beaker and then stirred for one minute. 20ml of the prepared solution from both the beaker is poured into the new beaker and stirred for one to four minutes. Two glass substrates are used and cleaned by distilled water. The glass substrate is dipped to the prepared solution. Solution is kept in the hot air furnace at 120°C for 4-5 hours for the growth of the ZnO-SnO2 Nano composite. After removing from the furnace. The solution was allowed to cool naturally to room temperature. The prepared samples were subjected to the SEM and X-ray diffraction.

3. RESULTS

Scanning electron microscope technique is used to characterize the particle size, surface morphology of the coated thin film layer. In the SEM analysis it is able to distinguish between the nanostructures and differentiate between nanorods, nanowires etc.

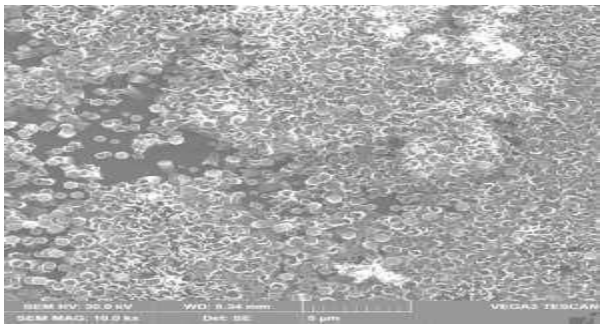

Fig. 2: SEM image of the ZnO Nano rods at 5µm scale

Thus the analysis is effective to detect contamination in the sample composition. SEM image can also be used to view cross section of coatings deposit, microstructures, thickness and many more. Scanning electron microscopy (SEM) is widely used within different scientific fields for the characterization of nanomaterials, nanostructures, and is an excellent technique for investigating the surface morphology at the nanoscale dimensions. By using SEM it is often possible to distinguish features on the scale of 10µm or less. Figure 2, and 3 Shows SEM images for ZnO Nano rods at 5µm and the Nano composite.

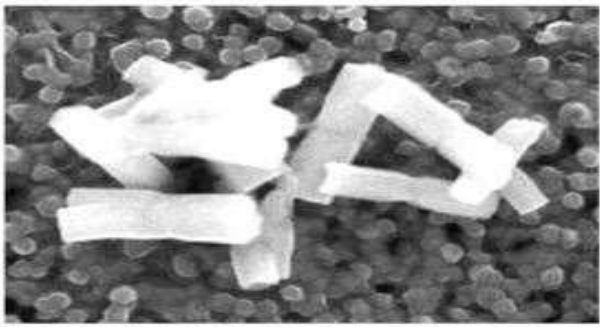

Fig. 3: SEM image of ZnO–SnO2 nanocomposite

4. CONCLUSION

TMA gas sensor is able to operate at room temperature and fabricated using the hydrothermal method thus eliminating the need of heating element which consumes more power and space in the design of the gas sensor. We have an efficient RFID based system to detect the marine food decay.

5. REFERENCES

[1] Yoon-Min Hwang, Junghoon Moon and Sunggoo Yoo "Developing A RFID-based food traceability system in Korea Ginseng Industry Focused on the business process reengineering" International Journal of Control and Automation, 2015, v.8, no.4, pp.397 – 406.

[2] Ababouch L, Karunasagar I. "Global fisheries and aquaculture Opportunities and Challenges", 10th World Marine food congress, Canada. Department of Fisheries and Aquaculture, FAO, Rome, 2013.

[3] Salagrama Venkatesh. Policy Research "Implications of Liberalization of fish trade for Developing countries". Project PR 26109, Integrated Coastal Management, 2004.

[4] Young Chan Choe, Joowon Park, Miri Chung "Effect of the food traceability system for building trust Price premium and buying behaviour Information Systems Frontiers", 2009, Volume 11, Number 2, Page 167.

