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Nanostructured semiconducting oxide thick films for monitoring food freshness

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Nowadays, people use the junk foods and readily available foods in packets available in the market, due to rush and rush in their routine works. Also, the modern life style prefers the food packets in birthday like parties. Some foods like tomato souse, ketchups, fruit crunches, fish, agricultural products, animal products, etc. are made the mandatory part of daily lives. Such foods may get degraded if not stored properly. It has been observed that, the cold storage units are not available in all the shops. This is the major problem in villages. Even though the degradation of such foods is less in amount, it affects the human health, on consumption, in terms of various diseases, viz. vomiting, diarrhoea, indigestions, stomach disorders, physiological and psychological disorders, etc. So, there is a strong need to detect the food freshness.The bismuth oxide powder synthesized at optimized conditions with the definite particle size was utilized in the form of thick films for monitoring food freshness. The effect of degradation time, the type of food, the surface nanostructure, operating temperature, long duration, long term exposure, etc. on the food freshness of the samples were studied and discussed.

Keywords: Junk foods, Tomato Souse, Ketchup, Fish, Food Freshness, etc

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Room temperature gas-sensing properties of multi-walled carbon-nanotubes functionalized with phthalocyanine

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Multi Wall Carbon Nanotubes (MWCNTs) have attracted extensive attention in sensing and storage of gases due to their unique one-dimensional carbon nanostructure and electrical properties. On the other hand, due to their high surface areas, central hollow cores and the outside walls, carbon nanotubes can be used as a superior material to adsorb and storage gases, such as oxygen, hydrogen, chlorine and nitrogen oxides. CNTs can respond to both reducing and oxidizing gases through a charge transferring reaction with the gas molecules that changes their conductivity [A]. Multiple research groups have focused on studying and improving the response of CNT-based sensors. Recently, in order to improve the sensing performance of these MWCNTs based sensors, many sensing materials such as conducting polymers, metals and metal oxides have been anchored on the surface of MWCNTs and play important roles in the improvement of the sensitivity and selectivity of the resultant gas sensors. Phthalocyanine (Pc), as an excellent sensing material, has been extensively studied based on its high sensitivities, excellent thermal and chemical stability. The electrical conductivity of phthalocyanine thin films can be changed by the presence of oxidizing or reducing gases.In this work, we have prepared a hybrid material of MWCNTs-COOH and F_{16}ZnPc. The formation of F_{16}ZnPc/MWCNTs-COOH hybrid was confirmed by UV-Visible, Raman and FT-IR spectroscopy. SEM, TEM and AFM studies revealed that F_{16}ZnPc molecules were successfully anchored on the surface of MWCNTs-COOH through π-π stacking interaction. Subsequently, a chemi-resistive sensor have been fabricated by drop casting F_{16}CuPc/MWCNTs-COOH hybrid onto alumina substrate. The gas sensing potential of the fabricated hybrid materials has been tested upon exposure to different hazardous gases like NO_2, NO, Cl_2 and NH_3 at different operating temperatures. It has been demonstrated that F_{16}ZnPc/MWCNTs-COOH hybrid is highly selective towards Cl_2 with minimum detection limit of 100 ppb. The response of sensor increases linearly with increase in Cl_2 concentration.The results obtained emphasize on the application of F_{16}ZnPc/MWCNTs-COOH hybrid material in Cl_2 sensing applications.

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