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Gamma radiation synthesis of silver nanoparticles stabilized in chitosan for agricultural application

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Gamma rays irradiation is a convenient method for preparation of colloidal silver nanoparticles (AgNPs). The analytical results from UV-vis spectra and TEM images showed that the AgNPs with particle sizes of approx. 10 nm was successfully prepared by irradiating the solution of 10 mM $AgNO_3$ in 1% chitosan at 28 kGy. The *in vitro* antifungal activity of AgNPs against three kinds of phytopathogenesis funguses was investigated. The results showed that the addition of 20 - 100 ppm AgNPs inhibited the growth of *Phytophthora capsici* (a fungus causing the serious Foot Rot disease on pepper plant) on CRA medium 22.6 - 92.9%, respectively. For *Corynespora cassiicola* fungus causing *Corynespora* leaf fall disease on rubber plant, its growth was inhibited from 6.3 to 100%, corresponded to the supplementation of AgNPs with concentrations from 10 to 90 ppm. In addition, the test on *Fusarium oxysporum* causing *Fusarium* wilt disease on tomato also pointed out that the treatment of AgNPs with concentration from 20 to 30 ppm also inhibited the growth of this pathogenesis fungus from 50.5 to 94.9%, respectively. Thus, the AgNPs product prepared by gamma radiation method using chitosan as a stabilizer may potentially be used as an antimicrobial agent in agriculture for controlling the pathogens on plants due to several reasons such as the environmentally-friendly production technology, highly antimicrobial effect and safety for using.

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Electrospun Ce-doped SnO_2 and ZnO hollow nanofibers and their gas sensing applications

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Electrospinning is a simple, inexpensive and versatile method for producing nanofibers from their corresponding solutions with high aspect ratio, flexibility and high tensile strength. Nanofibers in addition provide large surface area to volume ratio which is also attractive for sensing applications. Pure SnO_2, which is in general n-type semiconductors, is limited in gas sensing applications due to its low sensitivity, slow response and lack of selectivity. However, doping with Ce has improved the sensing performance and has shown a high selectivity to ethanol. Obtained fibers were in the form of hollow tubes with diameters in the range of 110-200 nm as shown in Figure 1. All hollow nanofibers (pure and Ce-doped SnO2 with 3, 6 and 9 mol%) exhibit high sensitivity and good repeatability to ethanol at 250°C. Among them, the 6 mol% Ce-doped SnO2 hollow fibers shows the highest sensor response to ethanol, the same sample shows the highest sensor response to toluene at 350°C. Also, Ce-doped ZnO hollow nanofibers with different doped Ce ratios (3, 6 and 9 mol%) are synthesized by an Electrospinning method using zinc acetate dihydrate and cerium(III) nitrate hexahydrate as starting materials and DMF as solvent. The simple low cost gas sensor is made with electrodes of aluminium and gas sensing properties are tested for methane gas at room temperature. The sensitivity has increased when the concentration of the gas is increased, but the response time remains almost equal. The results obtained in this study indicate that both SnO_2-CeO_2 and ZnO-CeO_2 nanofiber composites are potential candidates for use as high sensitivity gas sensors.

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