Nano-zinc oxide-doped activated carbon for feed additive from popped rice

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Abstract: Synthesis of nano-zinc oxide-doped activated carbon based on popped rice was performed. Popped rice with porous structure was prepared by hot air heating of un-milled rice. Chemical activation of ground popped rice was treated by using zinc chloride solution. Pyrolysis was carried out under constant nitrogen flow (5 l/h). The temperature of the pyrolysis was raised at 10°C/min up to 800°C and maintained for 1 h. The adsorption properties of activated carbon were investigated by ultraviolet-visible spectroscopy (UV-Vis). The results showed that prepared activated carbon with maximum particle size of 45 microns presented high adsorption capacity of methylene blue comparable to commercial activated carbon. The structure and morphology of zinc oxide nanoparticles were characterized by X-ray diffraction (XRD) and transmission electron microscopy (TEM). Zinc oxide nanoparticles with particle size in the range of 10-20 nm were generated and depicted on the surface of activated carbon. High capacity of toxin adsorption was exhibited by the produced activated carbon. The percent adsorption of aflatoxin, zearalenone, and fumonis in were 91.43, 90.54, and 90.30, respectively. The outcome indicates that high surface area of activated carbon based on popped rice with zinc oxide nanoparticles in the structure could be used as animal feed additive.

Keywords: Popped rice; Activated carbon; Nano-zinc oxide; Feed additive