SILVER NANOPARTICLES INCORPORATED IN PHYLLOSILICATES

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Wastewaters contain a wide variety of organic compounds, such as organochlorine pesticides, organophosphorus peptides, chlorophenols, fuels, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, dyes, among others. In the last decades, harmful organic compounds such as those have been reversed in the environment. AOPs (Advanced Oxidation Processes) are essentially physico-chemical technologies based on the in situ generation of oxidizing species that have a high reactivity to organic and inorganic matter. The aluminosilicate family includes a wide variety of amorphous and crystalline philosophies, such as clays, clay minerals and tectosilicates (e.g., zeolites). Silver nitrate ($AgNO_3$), sodium chloride (NaCl), sodium tetrahydroborate ($NaBH_4$), ethanol (C_2H_5OH), Malachite Green (MG, $C_{23}H_{25}N_2$, MW: 364.911 $g.mol^{-1}$), Tartrazine (AY23, $C_{16}H_9N_4Na_3O_9S_2$, MW: 534.3 $g.mol^{-1}$) Levenhuk immersion oil, Gram Staining kit for microscopy, were obtained from Sigma-Aldrich (USA). Bentonite (BN) were purchased from Fluka. A facile, eco-friendly and cost-effective method involving an aluminosilicate coated with silver was developed to prepare a microporous material (BN-Ag^0) core shell with high catalytic and bactericidal /bacteriostatic activities against newly isolated bacterium from sewage sludge, named *ISO SS.* The catalytic activity of this nanomaterial was tested in catalytic ozonation processes targeting a total mineralization of MG and AY23 dyes. In the case of adsorption as well as non-catalytic or catalytic ozonation of the azo dye AY23 solution, the mineralization did not take place due to the appearance of the hyperchromic effect, providing clear confirmation of the nonoccurrence of dye adsorption / mineralization. The results were supported by an increase in the intensity over time of the absorbance of the dye solution (5×10^{-5}M) at 425 nm on BN and BN-Ag^0, and was also reflected by a visible progressive increase in coloration. The best yield in the degradation of dye MG was 86.45% was obtained by using 2.5 mg/20 mL of Bn-Ag^0 and 0.5 g/h of ozone. Compared with the simple ozonation and catalytic ozonation with BN, the introduction of the BN-Ag^0 greatly reduce the duration of the process, from 1 hour and 50 minutes with a yield of 97% in just 5 minutes with a yield of 86.45%. In parallel to the catalytic activity against MG and AY23, the antibacterial activity of BN-Ag^0 using different amounts (from 10 to 30 mg) was evaluated for *ISO SS*. An inhibition zone was observed and bacteria don't remain on the entire surface, showing the presence of an 4 mm of inhibition zone with a diffusion process around the sample. The diameter of the inhibition zone against *ISO SS* using clay embedded with Ag^0 was found to vary according to the amount of the material.

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