Biocarbon adsorption and TiO_2/solar photodecomposition of binary and tertiary antibiotics systems

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The occurrence of pharmaceutical residues in a polluted environment includes the exposition to a contaminant mixture including antibiotics rather than individual toxic compounds. Some published results confirm the detection of a variety of antibiotics in soil and water environment as binary and tertiary systems which highlight the importance of antibiotics removal study of from a binary and tertiary mixture. Experimentaly the antibiotic mixture was preheating before adding TiO_2 and kept in a solar radiation chamber with constant temperature and pH values. The collection of the suspension aliquots allows the photodecomposition control followed by the addition of micronized biocarbon (diameter < 500 mesh) agitation and centrifugation. The supernatants measurements used spectrophotometer UV-Vis at λ = 273nm, 261nm, and 373nm to amoxicillin, cephalexin, and oxytetracycline, respectively. All results indicate the TiO_2/solar photodecomposition followed by biocarbon adsorption have better agreement with pseudo-second-order kinetics. The comparison between the antibiotics photodecomposition removal percentages of the binary mixtures indicates higher decomposition for amoxicillin (57,38%), followed by cephalexin (48,04%) and considering the tertiary antibiotic systems the oxytetracycline (14,63 %). Such removal difference is a result of the antibiotics chemical structure and bounding energy broken by the hydroxy radicals of the solar/TiO_2 photodecomposition reaction. For amoxicillin, the results refer to break the weak thiophene sulfur bond, for the cephalexin and oxytetracycline they have to break the strong hydrogen bonding of amide (amino carbonyls group) and the benzamide bond.The use of the biocarbon adsorption in the water treatment is final stage ensure the water quality polishing results.