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Water disinfection using silver nanoparticles impregnated coffee grounds: Escherichia coli and Staphylococcus aureus killing in batch-mode

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Silver nanoparticles (Ag-NPs) were impregnated on the surface of coffee grounds (CF) (referred to as Ag-CF hybrid, having 0.44 and 0.80 % weight of Ag), for achieving water disinfection in a batch set-up. First, Ag-CF was synthesized by coating with nature-inspired nanoparticles that containing Ag-NPs on their surface. Subsequently, Escherichia coli and Staphylococcus aureus cells-killing experiments were performed in a 1000 ml flask with Ag-CF hybrid (batch-mode) for 15 min. Experiment with E. coli using 50 mg Ag-CF hybrid having 0.80% weight of Ag per 1 ml cell suspension showed that, 106 CFU/ml of cells was completely disinfected within 15 min contact time. The visible colony was zero. For S. aureus, water having 106 CFU/ml S. aureus could not be completely killed in all treatments. A maximum inactivation of S. aureus was 98.75% for 50 mg Ag-CF hybrid having 0.80 % weight of Ag per 1 ml cell suspension at 15 min. Moreover, the pH and Ag concentration in the water after adding CF were 4.61 and 86 µg/L, respectively. Hence, water disinfection can be easily achieved in a batch manner within 15 min, with our Ag-CF addition.

Keywords: Silver nanoparticles, Antibacterial, Escherichia coli, Staphylococcus aureus

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