Efficiency of electrochemical denitrification using electrolysis cell containing BDD electrode

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ABSTRACT

In the present study, the efficiency of nitrates and nitrites removal was investigated in two types of electrochemical cell containing boron-doped diamond (BDD) anode/cathode or BDD anode and stainless steel (SS) cathode. The nitrates and nitrites removal rate was more than 90% using BDD cathode after 4 h of electrolysis using Na2SO4 as electrolyte. A low amount of NH3 was obtained for high initial concentration, and an important amount was rejected in the form of N2 gaseous. The nitrates removal was more affected when SS was used as cathode but nitrite removal remained higher, about 80%, with initial nitrites solution. An important amount of by-products was formed, and a low amount of N2 gaseous was rejected. A high amount of HO• radicals was produced at BDD anode/cathode, which promoted the direct oxidation of ammonia into N2 gaseous. Kinetic of nitrates reduction at BDD anode/cathode fitted well to pseudo-first order for 2 h of electro-reduction. Using BDD anode/cathode, current efficiencies are higher by contrast of energy consumption. The efficiency was confirmed from three initial concentrations of NaNO3 and NaNO2 in sulfates medium.

Keywords: BDD electrode; Stainless steel; Nitrates; Nitrites; HO•; Current efficiency; Energy consumption

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