



Elimination of pharmaceutical contaminants fluoxetine and propranolol by an advanced plasma water treatment

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ABSTRACT

Human activities have contaminated water sources with pharmaceutical compounds by the improper disposal of unwanted medicine or through sewage waste. The search for the most effective water treatment processes has been ongoing for decades. In the current paper, by exposing water to non-thermal plasma in a floating electrode streamer corona discharge (FESCD) system, both the antidepressant compound fluoxetine and the antihypertensive compound propranolol are eliminated. After 3 h of plasma treatment, more than 99% of each contaminant was degraded. The energy yield, which is the amount of contaminants degraded using 1 kWh of energy, was in the range of 0.12–0.13 g/kWh. The degree of mineralization calculated from total organic carbon (TOC) measurements was 60% and 17% for fluoxetine and propranolol, respectively. Reaction with hydroxyl radicals was the only degradation pathway for fluoxetine and its byproducts. For propranolol, hydroxyl radicals primarily caused the degradation butoxidation of secondary alcohols to ketones suggested the possible role of ozone molecules.

Keywords: Plasma; Pharmaceutical contamination; Energy yield; Mineralization; Degradation pathway

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