Decomposition of meta- and para-phenylphenol during ozonation process

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Introduction

Numerous environmental micropollutants that are widely used in many branches of industry exhibit endocrine-disrupting properties. The list of endocrine-disrupting compounds (EDCs) contains organohalogens, pesticides, phthalates, synthetic and natural steroids, alkylphenols, and phyto-oestrogens (Petrović et al., 2001). For many years, these chemicals were unknown or not recognised as hazardous. An increasing number of data in the literature concerning the negative impact of EDCs on living organisms has led to increased interest in methods of their degradation (Rosenfeldt & Linden, 2004; Esplugas et al., 2007). Liu et al. (2009) presented a review of methods of removal of these chemicals from wastewater.

Phenylphenols (ortho-, meta-, para-phenylphenol (o-PP, m-PP, p-PP)), hydroxylated derivatives of biphenyls, are used as preservative agents in food, textile, paper, leather, and the cosmetics industry, hence they are widespread in the environment. Phenylphenols were detected in surface water, riverine sediments, sewage sludge (Boz et al., 2001; Peng et al., 2008), and marine sediments (Agüera et al., 2003). Moreover, o-PP was also detected in canned beer and soft drinks in the United States and Germany (Coelhan et al., 2009). These compounds possess oestrogenic and androgenic potencies (Paris et al., 2002). The oestrogenic character of phenylphenol isomers is highly dependent on the position of the hydroxyl group in the aromatic ring. o-PP demonstrates the lowest oestrogenic activity. These properties increase slightly with the OH substitution in 3 position (meta) and for p-PP (Paris et al., 2002). The androgenic receptors’ antagonist activity of α-PP is 3–4-fold lower than of the meta- and para-isomers (Paris et al., 2002).

There are a few reports on phenylphenols degradation, of which the enzymatic (Bratkovskaja et al., 2004; Bratkovskaya et al., 2006) and activated sludge degradation are two examples (Yu et al., 2006). Yu

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