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Impact of UV disinfection on potential of personal care products components on chlorination by-products formation in swimming pool water

Agnieszka Włodyka-Bergier*, Tomasz Bergier

Department of Environmental Management and Protection, Faculty of Mining Surveying and Environmental Engineering, AGH University of Science and Technology, al. Mickiewicza 30, 30-059 Kraków, Poland, Tel. +48 12 617 47 57; Fax: +48 12 617 50 76; emails: wlodyka@agh.edu.pl (A. Włodyka-Bergier), tbergier@agh.edu.pl (T. Bergier)

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ABSTRACT

The article presents the results of studies on an impact of UV radiation on the potential to form several organic chlorination by-products in the model solutions, containing the ingredients of body care products (i.e., UV filters and parabens). The research was conducted on seven UV filters (ethylhexyl methoxycinnamate, butyl methoxydibenzoylmethane, 4-methylbenzylidene camphor, octocrylene, benzophenone-3, ethylhexyl salicylate, octyl dimethyl-para-amino-benzoic acid) and three parabens (methyl paraben, propyl paraben, ethyl paraben). The following by-products were studied: trihalomethanes (trichloromethane, bromodichloromethane, dibromochloromethane, tribromomethane), haloacetic acids (monochloroacetic acid, dichloroacetic acid, bromochloroacetic acid, dibromoacetic acid, trichloroacetic acid), haloacetonitriles (bromochloroacetonitrile, dibromoacetonitrile, dichloroacetonitrile, trichloroacetonitrile), haloketones (1,1-dichloro-2-propanone, 1,1,1-trichloro-2-propanone), chloropicrin, and chloral hydrate. The test of by-products formation potential was applied in the studies, with 24 h time of swimming water samples incubation. The water samples were chlorinated and irradiated with UV, generated with low-pressure UV lamp by Heraeus, Germany. Three UV doses were studied: 0 kJ/m^2 (water only chlorinated), 23.5 kJ/m^2, and 47 kJ/m^2. The research results have been used to assess how UV influences the reactivity of the studied model compounds and their potential to form halogenated organic chlorination by-products.

Keywords: Disinfection by-products; UV disinfection; Swimming pool water; UV filters; Parabens

* Corresponding author.

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