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Fate of fullerenes (C60) during peracetic acid (PAA) post disinfection of treated alum-enhanced combined sewer overflow (CSO) primary treatment

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Discharging combined sewer overflows (CSOs) directly or with minimal treatment into water bodies could elevate the concentrations of nanomaterials (NMs) in the receiving environment as a result of their extensive use in wide range of products. Among different NM types, fullerenes (C60) have been shown to pose risks on humans and aquatic organisms. Consequently, their fate and removal pathways should be assessed, and cost-effective and simple strategies to reduce their concentrations prior to their release should be developed. The objective of this study was to examine, for the first time, the fate of C60 in CSO when the effluent of alum-enhanced CSO primary treatment was disinfected with peracetic acid (PAA). A factorial design jar tests were firstly conducted to determine the optimum C60 removal conditions in terms of applied alum dose, mixing conditions and pH. At optimum coagulation conditions, the water was subjected to a post disinfection using PAA, and the effect of different PAA doses and contact times on the C60 transformation was investigated. The removal of C60 increased with the increase of contact time and applied PAA dose. It was also observed that acetic acid formation affected C60 detection. A further elucidation of the reaction mechanism and reaction by-products is underway.

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