Atlantium
Illuminating Water Technologies

APPLICATION BRIEF

UV Water Treatment
Hydro-Optic™ Technology

Redefining Purified Water by RO Technology and Advanced Oxidation Process for the Removal of Contaminants of Emerging Concern

This article aims to show that a proper multi-barrier process based on double-pass reverse osmosis (DPRO) and Advanced Oxidation Process (AOP) can deliver the highest level of quality for bottled water, ensuring the removal of contaminants of emerging concern (CEC).

CECs such as microplastics (MPs), poly and perfluoroalkylated substances (PFAS), as well as pharmaceuticals and personal care products (PPCP) are the protagonists of various research and have caused widespread concerns. In addition, the presence of CECs has had negative consequences in aquatic biota and research suggests that these contaminants may have adverse effects on living beings[1, 2, 3, 4], especially in the long term.

The disturbing ubiquity of these substances has led researchers around the world to verify the potability of the water we drink every day, and the results are alarming. A recent study shows that 93% of bottled mineral water has at least some sign of MP contamination[5], and another research points out to the presence of considerable amounts of PFAS in still and sparkling mineral water[6]. This concern not only lies in the presence of CECs in bottled water, but these compounds also accumulate in the human body — it has been shown that 98% of Americans have PFAS in their blood[7]. In addition, traces of MPs have been detected in different human organs. These statements generate a paradigm regarding what should be considered as "safe bottled water."

Taking into account the concept of bottled water as one that also guarantees the absence of CECs, a state-of-the-art water purification process through multiple barriers focused on CEC removal should be considered.

The proposed multi-barrier solution applies DPRO + AOP + Ozone disinfection. The DPRO system is based on LG Chem Thin Film Nanocomposite (TFN) DPRO membranes, specially manufactured for the removal of PFAS and a broad spectrum of emerging contaminants. DPRO rejects most of the organic compounds and CECs[8].

To ensure the highest water quality, DPRO is followed by an AOP step which applies Atlantium's Hydro-Optic™ (HOD) UV technology featuring pure silica (PS) lamps for the AOP step. The aim of this step is to eliminate trace organic compounds (TOrCs) that might pass through the TFN membranes. This is achieved as a result of the reaction between the hydroxyl radical

(generated by the HOD UV system) with the low molecular weight organic matter molecules that have not been totally rejected by DPRO membranes. These compounds can be "mineralized" by the AOP to CO_2 + H_2O without any residual to be removed.

By applying this multi-barrier process based on DPRO and AOP, we can redefine what is considered pure water. In addition, because this process is used for bottled water purification, it also ensures that no contaminants of emerging concern will be present in the water produced.

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