

Chemical Engineering

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UV/H₂O₂ processes for water treatment

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In surface water, increasing amounts and concentrations of organic micropollutants, like pesticides, pharmaceuticals, personal care products etc., can be found. This may affect not only the aquatic environment, but also sources for drinking water. Traditional water treatment techniques, will not remove the majority of these, often polar and hydrophilic, compounds. Advanced oxidation based on UV/H₂O₂ techniques may be used to convert these pollutants into smaller, better biodegradable, compounds or even to mineralize them into CO₂ and water. The process combines two reactions: direct photolysis of the compounds, and photolysis of H₂O₂, which results in the formation of hydroxyl radicals. These are very effective and non-selective oxidants. A major drawback of UV/H₂O₂ technology is its energy use. By means of modelling we were able to predict the conversion of micropollutants inside the UV reactor, but the model also was applied to optimize both reaction conditions and UV reactor geometry, resulting in a 30-40% decrease in energy use. Pre-treatment of the water, e.g. to remove the natural organic matter can improve the energy use by an additional 30-70%. This was demonstrated at two different drinking water production plants in the Netherlands. Furthermore, advanced oxidation was applied for wastewater treatment. In order to make the process more effective, pre-treatment of the water by means of e.g., ion exchange was applied, removing a major part of the effluent organic matter. Thus, it was shown that UV/H₂O₂ processes can be applied to improve the quality of both drinking water and wastewater.

Biography

Roberta Hofman-Caris has a Master's degree in Chemical Engineering and a PhD in Polymer Chemistry, both from Eindhoven University of Technology in the Netherlands. For 19 years, she worked at the Central Research Laboratory of Akzo Nobel, in the field of organic and polymer chemistry for coatings, pharmaceuticals and chemicals. In 2009, she joined KWR Watercycle Research Institute, as a Senior Scientist in the field of drinking water technology. Her major research topics are in oxidation and adsorption processes.

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