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How to avoid Disinfection Byproducts in Drinking Water? The potential of Adsorption and Photocatalysis

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To achieve safe drinking water, it is necessary to conduct several treatment processes to the raw water. One of the most important stages is the disinfection since this is the last barrier between water borne diseases and humans. During this stage, a disinfectant is added to the water to remove pathogens and other organisms. This is usually achieved by adding free chlorine to the water. However, this disinfectant can interact with the natural organic matter (NOM) and other dissolved organic pollutants (DOM) that can be present in the water and lead to the formation of unwanted byproducts – the disinfection byproducts (DBPs)[1,2]. These DBPs can include various classes of compounds, the most incident being trihalomethanes, haloacetic acids, haloacetonitriles and haloketones[3]. In order to decrease the presence of DBPs in drinking water, two alternatives can be considered: the decrease of NOM/DOM prior to the disinfection stage and the removal of DBPs at the end of the process. From these alternatives, the most efficient alternative is the former, however, the latter can still be applied[4,5].
In this work, these two alternatives will be studied, where phenylalanine was selected to be representative of DOM, since it is a well-known precursor for the formation of trihalomethanes, haloacetic acids and haloacetonitriles[3,6]. The removal of phenylalanine and DBPs will be performed by two different materials, silica aerogel adsorbents and layered double hydroxides photocatalysts, under several operating conditions.

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