

Mass transfer analysis of total nitrogen adsorption from river water onto tea waste (*Camellia Sinensis*)

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ABSTRACT

Natural lignocellulosic materials have becoming a popular trend in removing heavy metal ions. However, these materials have limited usage in organic and nutrient adsorption with the mass transfer analysis of the adsorption process remains uncommon. Hence, this study proposes the application of different pretreated tea wastes (untreated tea waste and acid treated tea waste) in total nitrogen adsorption to evaluate the mass transfer of the adsorption process. The experiment was conducted in a prototype where naturally contaminated water was collected and circulated through the different pretreated tea waste for five consecutive days. Total nitrogen in the water was tested every day according to the APHA method for which results collected are further evaluated using empirical mathematical models. The result indicated that acid treated tea waste (4.864 mg/g) possessed higher adsorption capacity than untreated tea waste (4.293 mg/g) in total nitrogen adsorption. Further evaluation identified the global mass transfer rate for acid treated tea waste (14.37422 d^{-1}) was greater than untreated tea waste (2.980625 d^{-1}) in 5% outflow of total nitrogen, primarily believed to be of higher initial concentration in the solution. Besides, porous diffusion mass transfer is seemingly the key factor that contributed to the entire adsorption process due to the porosity and surface area of the adsorbents. Finally, it can be concluded that tea waste is a good alternative adsorbent for total nitrogen removal from naturally contaminated water.

KEYWORDS

Global mass transfer; Porous diffusion mass transfer; Film mass transfer; Total nitrogen; Tea wastes

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