Adsorption of Perfluorooctanesulfonic acid (PFOS) using a silica-based aerogel

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ABSTRACT

The per- and polyfluoroalkyl substances (PFAS) are emerging contaminants and can be present in many sources such as fire extinguishing foams, shampoos, food containers, to establish anti-adherence for cookware. However, the use of these substances leads to their long presence in the environment, as they are 'forever chemicals', which can also contribute to the development of carcinogenic effects in humans. Therefore, it is fundamental to remove these pollutants from water. Silica-based materials have been known to be interesting pollutant adsorbents, being a possible solution to remove the PFAS in water. With this work, a silica-based aerogel was developed, by the sol-gel method, with an affinity to adsorb the PFOS from water. The material was characterized by SEM, water contact angle, BET surface area and zeta potential. To assess its possible applicability, the adsorption isotherms and kinetics were studied. Furthermore, the variation of the L/S ratio was also conducted to establish how it would affect the adsorption of the PFOS. The removal of the PFOS in continuous was also tested to verify how the removals would be affected by a constant intake of PFOS.

The adsorption isotherm showed a great affinity between the PFOS and the adsorbent synthesized, reaching removals from 94.5% to 100% for solutions between 5 and 200 mg L^{-1}. The adsorption kinetics showed that the equilibrium was reached within the first two minutes.

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