



Amyloid Fibrils Aerogel for Sustainable Removal of Organic Contaminants from Water

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Water contamination by organic pollutants is ubiquitous and hence a global concern due to detrimental effects on the environment and human health. Here, it is demonstrated that amyloid fibrils aerogels are ideal adsorbers for removing organic pollutants from water. To this end, amyloid fibrils prepared from β -lactoglobulin, the major constituent of milk whey protein, are used as building blocks for the fabrication of the aerogels. The adsorption of Bentazone, Bisphenol A, and Ibuprofen, as model pollutants, is evaluated under quasi-static conditions, without use of energy or pressure. Through adsorption by amyloid fibrils aerogel, excellent removal efficiencies of 92%, 78%, and 98% are demonstrated for Bentazone, Bisphenol A, and Ibuprofen, respectively. Furthermore, the maximum adsorption capacity of amyloid fibrils aerogel for Bentazone, Bisphenol A, and Ibuprofen is 54.2, 50.6, and 69.6 mg g⁻¹, respectively. To shed light on the adsorption equilibrium process, adsorption isotherms, binding constants, saturation limits, and the effect of pH are evaluated. Finally, the regeneration of the aerogel over three consecutive cycles is studied, exhibiting high reusability with no significant changes in its removal performance. These results point at amyloid fibrils aerogels as a sustainable, efficient, and inexpensive technology for alleviating the ubiquitous water contamination by organic pollutants.

Water contamination with organic pollutants is a major risk for human health and ecosystem sustainability. Organic pollutants are persistent, mobile in soil, accumulative in the environment, and cause serious environmental problems.^[1] Among organic pollutants, pesticides, phenolic compounds, and pharmaceuticals are considered the emerging contaminants of concern.^[2] In this study, Bentazone, Bisphenol A, and Ibuprofen were chosen as representative contaminants for pesticides, phenolics, and pharmaceuticals, respectively. Bentazone is one of the most widely used herbicides in agriculture and gardening around the world, especially following the banning of Atrazine in the EU in 2003.^[3] Bentazone has a relatively high water solubility and therefore a potential for displacing in soil and contaminating groundwater.^[3] In humans, it causes vomiting, diarrhea, dyspnea, tremors, and weakness, or generates eye irritation.^[4] According to the World Health Organization (WHO) report, the health-based value, which is protective