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Efficient purification of arsenic-contaminated water using amyloid–carbon hybrid membranes†

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We show the purification of arsenic-contaminated water using amyloid fibril-based membranes, which adsorb both the arsenate (+5) and arsenite (+3) oxidation forms at efficiencies of ~99%. Binding isotherms indicate that amyloid fibrils possess multiple binding residues capable of strongly adsorbing arsenic ions *via* metal–ligand interactions, delaying the saturation of the membrane. We also show that these membranes can be reused for several cycles without any efficiency drop, and validate our technology in purifying real contaminated ground water by removing arsenic with an efficiency as high as 99.6%. These results make this technology promising for inexpensive, efficient and low-energy removal of arsenic from contaminated water.

have strong limitations for arsenic removal, such as low efficiencies and/or poor effectiveness.[17] Furthermore, their efficiency is strongly dependent on the oxidation form of arsenic,[18] which is predominantly found in arsenite (+3) and arsenate (+5) forms out of the four possible states.[19] Most arsenic removal technologies, including reverse osmosis, are only effective in removing arsenate but not arsenite. Therefore, all major current treatment strategies include an oxidation step to convert arsenite to arsenate,[20,21] so the removal of arsenite from ground water remains both a challenge and an urgent demand.[22] Recently, we have shown that protein amyloid fibril-based hybrid membranes are a very efficient tool in removing heavy metal ions from water.[23]