HYBRID PROTEIN MEMBRANES: SNATCH CONTAMINANTS FROM WATER AND STRIKE GOLD

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Industrial development, energy production and mining have led to dramatically increased levels of environmental pollutants such as heavy metal ions, metal cyanides and nuclear waste. Current technologies for purifying contaminated waters are typically expensive and ion specific, and there is therefore a significant need for new approaches. Here, we report inexpensive hybrid membranes made from protein amyloid fibrils and activated porous carbon that can be used to remove heavy metal ions and radioactive waste from water. During filtration, the concentration of heavy metal ions drops by three to five orders of magnitude per passage and the process can be repeated numerous times. Notably, their efficiency remains unaltered when filtering several ions simultaneously. The performance of the membrane is enabled by the ability of the amyloids to selectively absorb heavy metal pollutants from solutions. We also show that our membranes can be used to recycle valuable heavy metal contaminants by thermally reducing ions trapped in saturated membranes, leading to the creation of elemental metal nanoparticles and films.

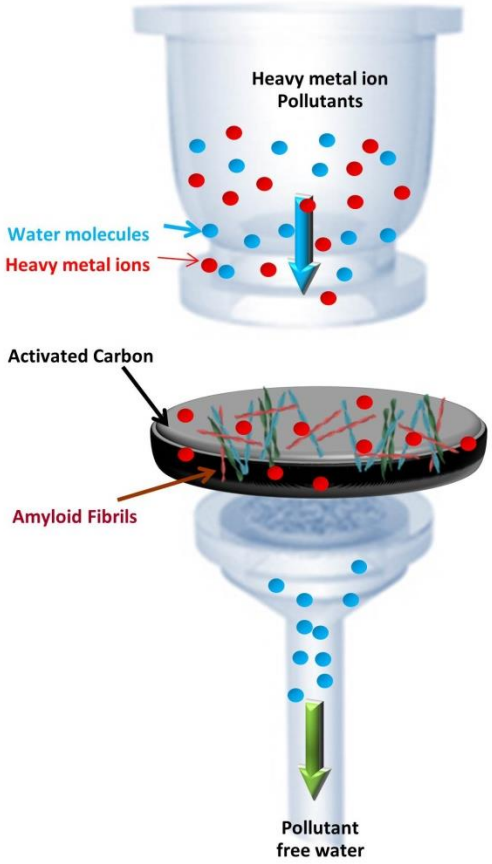

Figure 1 – Schematic representation of the composite activated carbon–amyloid fibril adsorber membrane and the heavy metal ion purification process for polluted water.

References:

Bolisetty, S., Mezzenga, R. Nature Nanotechnology 2016, 11, 365.