Environmental Science and Pollution Research

# REMOVAL OF PYRENE FROM DOMESTIC WATER SUPPLY USING POLYSTYRENE-BASED IMPRINTED POLYMER

--Manuscript Draft--

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| Manuscript Number: | ESPR-D-24-04849 |
| Full Title: | REMOVAL OF PYRENE FROM DOMESTIC WATER SUPPLY USING POLYSTYRENE-BASED IMPRINTED POLYMER |
| Article Type: | Research Article |
| Abstract: | Pyrenes (Pyr) occur from incomplete combustion of organic compounds resulting from both natural and anthropogenic activities. They are amassed in waterbodies through runoffs from contaminated soils and deposition from sewage discharges and they have long-term stability, mutagenicity, toxicity and possibly carcinogens in humans. Waterbodies which are sources for water treatment plants are reservoirs for various pollutants including Pyrene. Polystyrene (PS) forms larger global wastes, of which its management is of concern. Molecularly imprinted polymers (MIPs) are selective adsorbents but paucity of information exists using them as adsorbent for pyrene removal. This study seeks to develop PS as complimentary conventional water treatment methods for the removal of Pyrene in order to achieve the sustainable Development Goal 6 which calls for universal and equitable access to safe affordable drinking-water by 2030. Bulk polymerization (BP) was used to synthesize Pyrene imprinted polystyrene (PIP), and its non-imprinted analogue (NIP) using pyrene, styrene (STR), divinylbenzene (DVB), and benzoyl-peroxide (BPO). Polymerization produced a white NIP and crystalline yellow PIP. Monoliths were characterized using Scanning Electron Microscope, Fourier Transform Infrared Spectroscopy, and X-ray diffraction. Using batch adsorption (BA), different parameters were optimized. Pyrene concentration (0.05 mg/L) in domestic water supply (DWS) was greater than WHO standard (0.0002 mg/L). Pre-adsorption characterization results confirmed the identity of adsorbents while post-adsorption results showed clogged surface for NIP but the PIP was pyrene selective, hence having more adsorption sites. The best conditions for BA were pH 9, 4hr, 27 °C, 0.001 mgL-1 initial concentration and 1.0 g adsorbent dosage. Thermodynamics and kinetic studies showed the non-spontaneity and exothermic nature of a chemosorption process. The study concluded that both adsorbents removed pyrene from DWS with excellent adsorption efficiencies (100%). It is therefore concluded that PIP is best suited for pyrene removal from DWS. |
| Additional Information: | |
| Question | Response |
| §Are you submitting to a Special Issue? | No |



Cover Letter

Dear Editor,