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Surface charge zwitterions/PAN composite membrane filters for removal of charged matters in waste water

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Over 1 billion people, mostly in developing countries, currently lack access to clean drinking water. According to recent World Health Organization (WHO) report, around 70 percent of industrial discharge in developing countries goes untreated and low-income countries are hardest hit by contaminated water supplies and disease. Water pollution by heavy metal ion contamination is extremely poisonous not only to human beings but to all living organisms in general. Surface modified PAN membrane filter was developed to remove divalent metal ions in water which constituting a promising technology in portable water filtration system such as household filtration and water bottles. The prepared PAN membranes were hydrolyzed to enhance hydrophilic surface properties (wettability~24º) when compared to controlled PAN membrane (Wettability ~40º). PAN membrane was surface modified with selective charged polyelectrolyte zwitterionic polymer for enhanced adsorption/rejection and antifouling functionality. The particular membrane architecture emerges both positive and negatively charged membrane was developed through layer by layer dip coating process. Surface, compositional, thermal and wettability analysis of the triple layer membranes were confirmed by using Scanning Electron Microscope (SEM), thermal gravimetric analysis (TGA) and water contact angle measurement. FTIR spectra of surface modified PAN membrane filter exhibits a characteristic peaks at 1110 cm^{-1} and 1040 cm^{-1} originating from symmetric and asymmetric stretching of O=S=O from sulfonate groups of Zwitterionic polymer was observed. XPS analysis also confirm a predominate S2p (167eV) and N1S (402eV) peaks of the zwittorionic polymer. Static adsorption capacity of control PAN and surface modified membranes were evaluated using Pb^{2+} metal ion at fixed pH and concentration (pH 6 and 300 ppm). The filtering efficiency of the surface modified PAN membrane filters exhibits high as 80% for Pb^{2+} metal ions at optimum pH and Concentration. Developed compact, cost effective membrane filters will provide clean, fresh and safe drinking water, thereby significantly improving the health of population at risk due to poverty and low hygiene.

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