Direct copolymerization of elemental sulfur via inverse vulcanization for preparation of high Hg^{2+} -capacity adsorbent membrane

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Polysulfide-based membrane was evaluated to be very effective adsorbent for Hg^{2+} sequestration. Elemental sulfur was directly reacted with 2-carboxyethyl acrylate (CEA) to synthesize poly(sulfur-random-CEA) (poly(S-r-CEA)) polysulfide (PS). PS-PAN dope solution was electrospun. At 150 wt% loading of PS (S:CEA molar ratio = 2:1), the prepared PS has remarkable Hg^{2+} capacity (580-900 mg L-1) while PS-PAN nanofibers have maximum Hg^{2+} capacity of 470-610 mg L-1. Hg^{2+} adsorption on the PS-PAN membrane was spontaneous, endothermic and follows pseudo-second order rate model. Selectivity test exhibited that the membrane has affinity towards Cr^{2+}, Zn^{2+}, and Pb^{2+} and a little affinity towards Cu^{2+}. Furthermore, repeated adsorption-desorption test showed that the PS-PAN membrane can be reused for long time use. This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (No. 2016R1A2B1009221 and No. 2017R1A2B2002109), and the Ministry of Education (No. 2009-0093816).