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The aim of proposed work is to synthesize new hydrophilic poly(HIPE) polymers, study of their catalytic properties and feasibility of poly(HIPE) materials for bioseperation application.

New type of ion-exchangers – highly basic porous monolith with HIPE (High Internal Phase Emulsion) structureare prepared in the water in oil (W/O) and water in oil in water emulsion ($W_1/O/W_2$). Poly(HIPE) VBC/DVB (4-vinylbenzyl chloride /divinylbenzene) are modified with alkylimidazoles: N-methylimidazole to give poly(HIPE)M and N-butylimidazole poly(HIPE)B. These polymers had 1.83 $mmoLg^{-1}$ and 1.63 $mmoLg^{-1}$ nitrogen active centres. Similarly, Poly(HIPE)ViM monolith consisting of bis - vinylimidazolium salts are also prepared which showed 4.20 mmoL g^{-1} active centers. The structure of HIPE polymer was confirmed using Scanning Electron Microscopy (SEM). Ion-exchange ability and selectivity of monolithic anion-exchanger was tested towards the following inorganic anions: F^{-}, Br, Cl^{-}, NO_3^{-}, SO_4^{2-}, $Mo_7O_{24}^{6-}$, PO_4^{3-} and organic anions: malate, citrate, malonate, tartate, lactate and oxalate. Sorption of anions was done from single and multicomponent solutions.The adsorption experiments were performed under various pH. The experimental equilibrium data were used in Langmuir and Freundlich models. The adsorption isotherms for poly (HIPE)ViM showed the following order of adsorption capacity: SO_4^{2-}> NO_3^{-}> Br^{-}> $H_2PO_4^{-}$> Cl^{-}>F^{-}, for organic ions: oxalates: > tartate > malate > lactate> citrate. The adsorption isotherms for poly (HIPE)M show the following order of adsorption capacity: Br^{-}> NO_3^{-}>$H_2PO_4^{2-}$> F^{-}> Cl^{-} and for poly (HIPE)B: Br^{-}>$H_2PO_4^{2-}$> NO_3^{-}> Cl^{-} > $F^{-}$and for organic anions: oxalate > tartate > malate > lactate > citrate. In further sturdy, the catalytic activities of these poly(HIPE) polymers were tested by dialkylation and cycloalkylation of ethyl acetoacetate, The high yields of conversion and thus the high catalytic activity were shown by poly (HIPE)M[Br-] and (poly (HIPE)ViM[Br-]. The catalytic activity of these poly(HIPE)s for cycloalkylation of substrates like 1,4-dibromobutane and 1,2-dibromoethane was also tested.

The feasibility of poly(HIPE) materials for bioseperation application was also investigated. Glycidyl functionalized acrylate poly(HIPE)was synthesized by photopolymerization of the continuous emulsion of poly(ethylene glycol)/methyl ether methacrylate(PEG/MA). The resulting polymers showed a porosity of up to 94%. This material was studied for potential bioseperation application of immunoglobulin IgG by immobilizing protein A. In an another approach, molecularly imprinted poly(HIPE) nanaoparticles based on the VBC/DVB were also tested for bioseperation application.