Sintesis kitosan termodifikasi praseodimium sebagai adsorben dan adsorpsinya terhadap ion fluorida dalam air minum = Synthesis of chitosan modified praseodymium as adsorbent and its fluoride ions adsorption in drinking water

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Abstrak

Konsumsi air minum dengan kandungan ion fluorida yang tinggi (4 ppm) dapat meningkatkan risiko kelumpuhan akibat kerapuhan tulang. Dalam penelitian ini, dilakukan pengujian potensi adsorpsi kitosan-Pr dalam defluoridasi air minum secara batch. Penelitian ini mencangkup sintesis kitosan-Pr dengan metode impregnasi dan presipitasi, pengujian adsorpsi ion fluorida serta desorpsinya secara batch. Pengaruh waktu kontak, jumlah adsorben dan anion kompetitor diuji melalui variasinya dalam uji adsorpsi. Konsentrasi loading Pr3+ diuji untuk mencapai pemenuhan standar kandungan ion fluorida dalam air minum (1,5 ppm). Kadar ion fluorida diukur menggunakan spektrofotometer UV-Vis pada panjang gelombang 570 nm dengan metode SPADNS (sodium 2-(parasulfophenylazo)-1,8-dihydroxy-3,6-naphtalene disulfonate). Efisiensi adsorpsi terbaik (92,77%) yang diperoleh kitosan-Pr hasil presipitasi dengan konsentrasi loading Pr3+ 6,86%wt sebanyak 10 g pada waktu kontak 60 menit dan kapasitas adsorpsi sebesar 0,039 mg/g ini telah memenuhi standar Permenkes RI mengenai kadar fluorida dalam air minum dengan kadar fluorida akhir sebesar 1,446 ppm. Kitosan-Pr sesuai dengan model isoterm Langmuir dengan kinetika adsorpsi mengikuti pseudo orde kedua. Adsorben terbaik dikarakterisasi dengan FTIR, SEM-EDX dan XRD. Kondisi terbaik regenerasi kitosan-Pr diperoleh dengan menggunakan larutan NaOH (1:10) konsentrasi 0,1 M pada suhu agitasi 50°C.

.....Drinking water consumption with high flouride levels (4 ppm) could increased risk for bone fractures. In this study, adsorption potential of chitosan-Pr was investigated for defluoridation of drinking water in batch system. This study present synthesis of chitosan-Pr using impregnation and precipitation methods, fluoride ions adsorption experiments and its desorption using batch technique. Effects of contact time, adsorbent quantity and anion competitors were caried out by each variation in adsorption experimental study. Loading Pr3+ concentration was investigated to fulfill the standard of fluoride ions in drinking water (1,5 ppm). Fluoride ion concentration was investigated using spectrophotometer UV-Vis at 570 nm wavelength appropriate with SPADNS (sodium 2-(parasulfophenylazo)-1,8-dihydroxy-3,6-naphtalene disulfonate) method. The best adsorption efficiency (92,77%) of chitosan-Pr which obtained from precipitation method with loading Pr3+ concentration 6,86%wt, 10 g of weight at 60 minutes contact time and 0,039 mg/g of adsorption capacity was qualified with Permenkes RI standard of fluoride concentration in drinking water with 1,446 ppm as final fluoride concentration. Chitosan-Pr fit with Langmuir isoterm model and pseudo second order for its adsorption kinetics. The best adsorbent was characterized with FTIR, SEM-EDX and XRD, whereas its best regeneration operation was suggested by using 0,1 M NaOH (1:10) at agitation 50°C.