Zirconium (IV) phosphate/poly(gelatin-cl-alginate) Nanocomposite as Ion Exchanger and Al\(^{3+}\) potentiometric Sensor

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Zirconium (IV) phosphate/poly(gelatin-cl-alginate) (ZP/PGA) nanocomposite ion exchanger was studied as potentiometric sensor for the detection of aluminium ions in aquatic system. ZP/PGA has been analysed by X-ray diffractometer (XRD), Fourier transform infra-red spectrogram (FTIR), thermo-gravimetric analysis (TGA), field emission scanning electron microscopy (FESEM) and high resolution transmission electron microscopy (HRTEM). TGA and XRD analysis revealed that ZP/PGA nanocomposite was highly thermo-stable and semi-crystalline in nature. The pH results show the bifunctional nature of ZP/PGA nanocomposite. Distribution studies concluded the greater sensitivity of material for aluminium ions \((K_d=65)\). Thus, the assembly of potentiometric sensor for the estimation of Al\(^{3+}\) using ZP/PGA was attempted. Linear Nernstian response was detected over wide concentration. The binary separations such as Ni\(^{2+}\)-Al\(^{3+}\), Zn\(^{2+}\)-Al\(^{3+}\), Co\(^{2+}\)-Mg\(^{2+}\), Cu\(^{2+}\)-Mg\(^{2+}\), Cd\(^{2+}\)-Pb\(^{2+}\), Co\(^{2+}\)-Pb\(^{2+}\), Zn\(^{2+}\)-Cu\(^{2+}\), Ni\(^{2+}\)-Cd\(^{2+}\) have been attempted onto ZP/PGA column. The efficiency of ZP/PGA was investigated for remediation of methylene blue (MB) and methylene green (MG) under solar irradiations. ZP/PGA also showed good antimicrobial activity for \(E.\ coli\).

**Keywords:** Nanocomposite, heavy metals, ion selective electrode, photocatalysis, antimicrobial.