Gamma Irradiation Induced Pectin-Acrylamide- (Vinyl Phosphonic Acid) Hydrogel for Selectively Metal Ion Adsorption

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Introduction

Recently, Metal adsorption by using different types of adsorbent is an attractive research worldwide. Hydrogels are three dimensional polymeric network which can retain large amount of solvent (water) without dissolving in it[1]. Due to cheap raw materials for preparation, non-toxicity, biodegradability and selectivity toward specific metal ion, hydrogels are used widely as adsorbent for metal recovery[2]. Pectin is a natural polymer which contains both carboxyl and hydroxyl group in its structure and can used for the preparation of hydrogel by grafting of various monomers on its backbone. In the present meeting, the authors will report on the preparation of Pectin-Acrylamide (AAm)-Vinyl Phosphonic Acid (VPA) hydrogel by applying different doses of gamma radiation and the uses of synthesized hydrogels in selective metal adsorption from multielement solution.

Experimental

Gelatinized pectin solution was prepared by dissolving pectin in water at 40℃ temperature and stirring at 500 rpm. AAm and VPA were added to make the blend and irradiated at different radiation doses from ^{60}Co ɣ-ray source. After irradiation, obtained hydrogels were extracted in water at 50℃ temperature for 24 hours. The resultant gels were used for adsorption of heavy metal ions from the solution of multielement. The concentration of metal ions was measured by ICP-MS.

Results and Discussion

It was found that the gel fraction of hydrogel increases with increasing the radiation dose reaches a maximum and start decreasing with increasing the dose. The optimum radiation dose and the composition of raw materials were determined on the basis of equilibrium swelling and found 1:2:3 (Pectin:AAm:VPA) composition and 20 kGy dose. Differential scanning calorimetry reveals the gel strength for using as the adsorbent. The FTIR-spectrum confirmed the grafting/ crosslinking of the monomer on the backbone of pectin chain. Figure 1 shows the selective adsorption of Al, Mo, Fe, Ga, In and Bi from the solution of multielement. SEM images of hydrogels and metal adsorbed hydrogels indicate the adherence of the metal in the interpenetrating network of hydrogels which were supported by EDS spectrum.

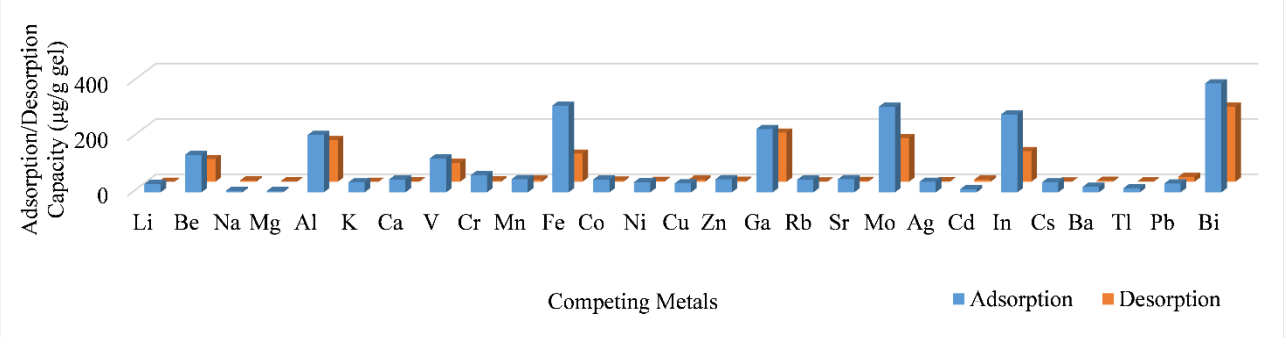

Fig.1 Selective adsorption of Al, Mo, Fe Ga, In and Bi from the solution of multielement.

Acknowledgement

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References

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