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PRECONCENTRATION OF VANADIUM (V) WITH VARIOUS COMPOSITE MATERIALS

Vanadium a very spread and heavy transition metal and is among the 20 most abundant elements in the Earth's crust: the content in the crust is 0.0015% (mass) [1]. Trace amount of vanadium is an essential for human body. Vanadium compounds increase the effects of insulin and have been shown to lower blood glucose in animal and human experiments in diabetic individuals.

Vanadium can exist in a range of oxidation states, from +2 to +5 and in solution, under environmental conditions, mainly vanadium (IV) and vanadium (V) are present. The poisonousness of vanadium is reliant upon its oxidation state, with vanadium (V) being more harmful than vanadium (IV). Vanadium oxides and other compounds have been widely used in industry, as catalysts in organic and inorganic synthesis, such as in synthesis of sulfuric acid, acetic acid and etc. Vanadium pollution can cause potential harmful effects on ecological systems, and lead to animal poisoning and human disease [2].

Adsorption is the best way to reduce the heavy metal ions from aqueous media. This kind of methods are effective and moderately priced. Adsorbents also can be regenerated and used several times. A large number of studies about preconcentration of vanadium(V) from aqueous solution have been reported [3-7]. These preconcentration methods involve synthetic and environmentally friendly adsorbents, such as bentonite based [3], chitosan based [4, 5], starch [6], activated carbon [7] and etc.

Adsorption materials based on chitosan and bentonite find the widespread application in preconcentration of vanadium ions from different aqueous solutions. Chitosan is a linear polysacharide, has two randomly placed functional groups; amino [α-(1,4) glucosamino and N-acetylglucosamine] and hydroxyl groups. This two functional groups are responsible for high sorption capacity of chitosan. Chitosan can be produced by deacetylation of chitin. Chitosan is a nontoxic, biodegradable and hydrophilic. In order to create new, more efficiency composite materials chitosan was modified with different cross linking reagents such as aromatic aldehydes [8], epichlorohydrin [9], epoxy chloropropane [10] and etc. Modification of chitosan with carboxylic group can increase its solubility an carboxylated chitosan is more beneficial for removing metal ions than without it [11]. In order to investigate adsorption of vanadium onto inorganic biopolymer based on chitosan-Zr was synthesized [12]. Some parameters affecting the adsorption capacity such as pH, initial concentration, contact time, temperature and co-existing ions were assessed. Optimal pH of adsorption is 4. Maximum sorption capacity is mg^{-1}.

New method was described for preconcentration of vanadium (V) [14]. A selective method is proposed for preconcentrative determination of vanadium(V) using the synthesized 3-hydroxyben-zaldehyde-4 Amino antipyrine (HBAP), which was bounded on chitosan. Optimum pH of adsorption is 3.5. the better response time is 30 min.

On base bentonite was produced aluminum-pillared clay (Al−PILC) to remove of vanadium ions from aqueous solutions [3]. Batch experiments were carried out and several factor that determine the adsorption process such as optimal pH, contact time, initial concentration, adsorbent dosage and temperature was established. It was also established that percentage removal of vanadium decreased with increasing ionic strength. The adsorbent can be regenerated by using 0.1 M HCl.

With the intention of creating environmentally friendly adsorbents chitosan structure was modified with natural components such as alginate [11], bentonite, sand and kaolinite [13]. The adsorption of various heavy metal ions was investigated. The aim of this work comprises in a practicality study to see how vanadium particles could be eliminated from water by sorption onto different adsorbents based on chitosan and bentonite. Our future research will be synthesis of new environmentally friendly chitosan- bentonite composite and investigation of preconcentration of vanadium(V) ions with this adsorbent.

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