BERYLLIUM BIOSORPTION ON CHEMICALLY MODIFIED SULFONATED CHITOSAN: KINETICS AND THERMODYNAMICS STUDIES

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Sulfonated cross linked chitosan (SCG) has been synthesized for effective extraction of beryllium ions from their aqueous solutions. SCG has been obtained through two reaction steps. The first step is the conversion of chitosan into non-soluble cross linked chitosan (CG) by the interaction between chitosan and glutaraldehyde. The second step is the formation of sulfonate groups on the adsorbent surface through interaction between CG and chlorosulfonic acid.

Beryllium is brittle metal that is found in nature as a mineral. It has the ability to make strong covalent bonds beside its ability to form ionic bonds. It isn't soluble at neutral pH [1]. In recent decades, Scientists have given serious attention to the extraction of beryllium due to its high importance. It has been used in wide range in nuclear weapons and nuclear reactors, inertial guidance components, x-ray tubes, space optics, and microelectronics due to its light weight and high strength [2]. Although there are many methods for extraction and concentration of beryllium such as precipitation, ion exchange, ion flotation, liquid-liquid extraction and solid phase extraction-, adsorption is taken as the most effective and convenient technique [3]. Chitosan is one of the important natural cationic poly electrolytes. It is a random linear copolymer of (1-4)-N-acetyl-d-glucosamine and (1-4)-d-glucosamine units, derived by the deacetylation of chitin using high concentration of sodium hydroxide [4]. Because of easy dissolution of chitosan in dilute mineral acids, crosslinking treatments have been developed to reinforce chitosan stability in acidic solutions. The crosslinking treatments can be done by using different reagents such as ethylene glycol diglycidyl ether, epichlorohydrin, hexamethylenediisocyanate or glutaraldehyde. The Schiff's base reaction takes place between aldehyde ends of the crosslinking agent and amine moities of chitosan to form imine functions in case of using glutaraldehyde as crosslinking agent [5,6,]. In the present work, chitosan is undergone sulfation after crosslinking with glutaraldehyde by using chlorosulfonic acid as a sulfating agent and N, N-dimethylformamide as a medium. The sorption properties of the sulfonated crosslinked chitosan (SCG) have been tested by using batch method to achieve equilibrium parameters.

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СИНТЕЗ НЕСТЕХИОМЕТРИЧЕСКОГО ДИОКСИДА ТИТАНА В ПОТОКЕ ВОДОРОДА

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SYNTHESIS OF NONSTOICHIOMETRIC TITANIUM DIOXIDE IN HYDROGEN STREAM

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Nostoichiometric titanium dioxide (TiO_{2-x}) with different oxygen content was synthesized by sol-gel method followed by annealing in hydrogen stream at 200, 400, 600, 800, or 1000°C for one hour. Synthesized powders of TiO_{2-x} were characterized by XRD, BET, and DRS methods.

Образцы наноразмерного TiO_2 были синтезированы золь-гель методом при pH раствора равным 6. Исходными реагентами являлись тетрабутоксид титана $Ti(C_4H_9O)_4$, этиловый спирт C_2H_5OH и вода H_2O. Гомогенизация раствора проводилась в перемешивающем устройстве в течение 90 мин при температуре 60 ºС. Сушка полученных гелей происходила на воздухе в течение 10 часов. Отжиг порошков TiO_2 проводился в потоке водорода в течение 1 часа в печи МПТ-2МР при температурах 200, 400, 600, 800 и 1000°С. Водород вырабатывался в устройстве генератора чистого водорода ГВЧ-12А.

Рентгенограммы синтезированного порошка TiO_2 и порошков после отжига в среде водорода получены на автодифрактометре Shimadzu XRD-7000. Размер областей когерентного рассеяния (ОКР) оценивался по формуле Шеррера. Ширина запрещенной зоны (ЗЗ) рассчитана с помощью функции Кубелки-Мунка по