СТАРА ЗАГОРА
6-7 ЮНИ 2013

ДВАДЕСЕТ И ТРЕТА МЕЖДУНАРОДНА НАУЧНА КОНФЕРЕНЦИЯ
НА СЪЮЗА НА УЧЕНИТЕ В СТАРА ЗАГОРА

"ПРЕДИЗВИКАТЕЛСТВАТА пред УЧЕНИТЕ във ВРЪЗКА с НОВАТА ПРОГРАМА за НАУКА и ИНОВАЦИИ на ЕС "ХОРИЗОНТ 2020"

23rd INTERNATIONAL SCIENTIFIC CONFERENCE, 2013

OF THE UNION OF SCIENTISTS IN STARA ZAGORA

Challenges for scientists in relation of the new program for science and innovation of EU "HORIZON 2020".

ДВАДЕСЕТ И ТРЕТА МЕЖДУНАРОДНА НАУЧНА КОНФЕРЕНЦИЯ НА СЪЮЗА НА УЧЕНИТЕ В СТАРА ЗАГОРА
СТАРА ЗАГОРА
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9. ***А. Попов, А. Паличев, С. Узова, С. Михалева, Л. Димитрова, Т. Ангелов, В. Велев***

МИКРОСКОПСКО ИЗСЛЕДВАНЕ НА ВРЪЗКАТА МЕЖДУ КРИСТАЛОГРАФИЯТА И МОРФОЛОГИЯТА НА ПОЛИКАПРОЛАКТАМА. II. ИЗОТРОПНО СЪСТОЯНИЕ

10. ***А. Попов, А. Паличев, Х. Узов, В. Велев, Т .Ангелов, С. Михалева, Л. Димитрова***

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11. ***Никола Тодоров, Мартин Раденков, Донка Тодорова***

ОПОЛЗОТВОРЯВАНЕ НА ОТПАДЪЧЕН ГЛИЦЕРОЛ ОТ ПРОИЗВОДСТВОТО НА БИОДИЗЕЛ

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УСИЛВАНЕ НА БИОНАПРЕЖЕНИЯ—ДИФЕРЕНЦИАЛЕН УСИЛВАТЕЛ В ОБУЧЕНИЕТО ПО МЕДИЦИНСКА ФИЗИКА

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КЪМ АВТОМАТИЗАЦИЯ НА ПРОЦЕСИТЕ ПО УПРАВЛЕНИЕ НА КАЧЕСТВОТО В НАУКАТА С ПЛАТФОРМА КОМПАС

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ХИМИЧНИ МОДИФИКАЦИИ НА ФОСФОЛИПАЗА А2 ОТ VIPERA AMMODYTES: ЕФЕКТ ВЪРХУ КАТАЛИТИЧНИТЕ СВОЙСТВА

15. ***Бояна Гъркова***

ЧИСЛЕН АНАЛИЗ НА МАТЕМАТИЧЕСКИ МОДЕЛ, ИЗПОЛЗВАН В МЕДИЦИНАТА

ПОСТЕРНА СЕСИЯ

Постерите се поставят на определените места до 13.00 ч. на 06.06.2013 г. Обсъждането им в присъствието на авторите става след приключване на докладванията на 06.06.2013 г. Докладите от постерите в два екземпляра и CD се предават на ръководството на съответната секция.

POSTER SESSION

Poster discussion session will be in the same room after oral communications. In order to be printed in full, poster reports must be submitted to the chairman of the respective session /after discussion/ in two printed copies and a copy on CD.

1. ***George Z. Kyzas, Nikolina A. Travlou, Eleni A. Deliyanni***

MERCURY ADSORPTION ONTO MAGNETIC CHITOSAN

2. ***George Z. Kyzas, Nikolina A. Travlou, Eleni A. Deliyanni***

DYE REMOVAL FROM EFFLUENTS WITH MAGNETIC GRAPHENE OXIDE

3. ***Здравка Николаева***

КОРЕЛАЦИЯ НА СУМАРНАТА СЛЪНЧЕВА РАДИАЦИЯ С МЕТЕОРОЛОГИЧНИ ПАРАМЕТРИ ЗА БЪЛГАРИЯ

4. ***Людмила Димитрова, Кристина Петкова***

ОЦЕНЯВАНЕ НА РИСКА ПРИ РАЗРАБОТВАНЕ НА СОФТУЕР ПО ГЪВКАВИ МЕТОДОЛОГИИ С ПОМОЩТА НА БАЙЕСОВИ МРЕЖИ

5. ***Т. Врабчева, С. Тодорова, Д. Николова, Г. Чобанов, Б. Ликов, В. Христова-Багдасарян, Ж. Тишкова***

АНАЛИЗ НА ДАННИ ЗА НИВАТА НА АКРИЛАМИД В ХРАНИ НА ТЕРИТОРИЯТА НА БЪЛГАРИЯ ЗА 2010 г.

6. ***Dimitrova M,Christova L, Damianova E, Yordanova Y, Petrova N, V.Kapchina-Toteva***

ANTIOXIDANT ACTIVITY AND SECONDARY METABOLITES IN DIFFERENT EXTRACTS OF EUPHRASIA OFFICINALIS L. GROWING IN BULGARIA

7. ***Мария Лачева***

MYCOCOENOLOGICAL STUDY OF WOODY HABITATS IN VALLEY OF RIVER STRYAMA IN THRACIAN LOWLAND

8. ***Нанко Бозуков***

ИНФОРМАЦИОННА ТЕХНОЛОГИЯ ЗА ЕНЕРГИЙНИ СПЕСТЯВАНИЯ ПРИ ВНЕДРЯВАНЕ НА ПЛАСТИНЧАТИ ТОПЛООБМЕННИЦИ

9. ***Нанко Бозуков***

ИНФОРМАЦИОННА ТЕХНОЛОГИЯ ЗА ИЗЧИСЛЯВАНЕ НА ЕНЕРГИЙНИ СПЕСТЯВАНИЯ ПРИ СЪЗДАВАНЕ НА МИНИ-ТЕЦ С МЕСТНИ ГОРИВА

10. ***Йорданова Й. , Дамянова Е., Капчина- Тотева В. Жипонова М.***

ЕФЕКТ НА ФИТОХОРМОНИТЕ ВЪРХУ РАСТЕЖА И РАЗВИТИЕТО НА ГРАХ (PISUM SATIVUM)

11. ***Миряна Христова***

КОМУТАЦИОННИ СВОЙСТВА НА ОПЕРАТОРИ ОТ СМЕСЕН ТИП ЗАПАЗВАЩИ СТЕПЕНИТЕ

12. ***Елена Георгиева, Александра Петрова, Ганка Чанева***

ОЦЕНКА НА ОКСИДАТИВНИЯ СТРЕС, ВЪЗНИКНАЛ СЛЕД КРИОПРЕЗЕРВАЦИЯ ПРИ HYPERICUM RUMELIACUM BOISS. И HYPERICUM TETRAPTERUM FRIES.

13. ***Марийка Петрова, Илиана Костова***

АВТОМАТИЗИРАНО ИЗЧИСЛЯВАНЕ НА БИОЛОГИЧНА АКТИВНОСТ

14. ***Драгостин Маринов, Цветан Димитров***

СИНТЕЗ НА КЕРАМИЧНИ ПИГМЕНТИ НА ОСНОВА ПЕРЛИТ С УЧАСТИЕТО НА РЕДКОЗЕМНИ ЕЛЕМЕНТИ

15. ***Михаил Дойнов, Цветан Димитров, Драгостин Маринов***

ФЕРОШПИНЕЛНА КЕРАМИКА ОТ ОТПАДЪК

16. ***Десислава Лазарова, Даниела Станоева, Антоанета Попова, Мая Величкова***

ЕФЕКТ НА n-ПРОПИЛ ГАЛАТ ВЪРХУ РЕАКЦИОННИТЕ ЦЕНТРОВЕ НА ФС 1 И ФС 2 ПРИ НИСКОТЕМПЕРАТУРНО ФОТОИНХИБИРАНЕ

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INVITATION

FOR

23rd INTERNATIONAL

SCIENTIFIC CONFERENCE

June 6 - 7 2013
Stara Zagora

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CONFERENCE TO BE HELD AT:

"Maritsa Iztok" hotel, Stara Zagora Spa near Stara Zagora.

Registration and check-in:	8 am till 10 am on Jun 6th
Conference opening:	11 am till 12 am on Jun 6th
Panel discussions:	12 am till 6 pm on Jun 6th
Conference end and cocktail party:	8 pm on Jun 6th
Trip to historical sights:	9 am on Jun 7th

CONFERENCE AREAS:

We invite submissions of papers presenting original researches in topics including the following areas:

- **Medicine (Biological and Clinical Studies).**
- **Veterinary Medicine (Biological and Clinical Studies).**
- **Agricultural Science (Animal Husbandry, Crop Production).**
- **Engineering Studies.**
- **Nautical and Environmental Studies.**
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- **Chemistry.**
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The Organizing Committee is ready to set up additional conference sections.

OFFICIAL LANGUAGES: Bulgarian, English and Russian.

IMPORTANT NOTE:

The reports (posters) will be published in on-line journal "Science & Technologies" with ISSN - 1314-4111, and on optical bearer if they response to the requirements mentioned above and are presented on the conference. They don't have to be published before. Two copies of the report have to be submitted to the chairman of the respective section after reporting them together with a CD with the text typed on MS Word.

Articles may be also delivered on poster only.

Poster session: The posters will be discussed after the report presentations during the respective sessions.

The posters have to be submitted on an easel stand with size of 120x70 cm. In order to be printed in the Proceedings the materials have to comply with the requirements for the reports.

Registration Fee: The fee for participation with one paper is EUR 100 and with two papers is EUR 150. It includes conference kit containing programme booklet and additional conference information, proceedings with the full-length articles presented at the conference, resumes of the articles to be published on Union's web site, morning and afternoon coffee breaks, and cocktail.

Trip fee:

Historical sights: Stara Zagora, Kazanlak, Shipka EUR 30

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MERCURY ADSORPTION ONTO MAGNETIC CHITOSAN

George Z. Kyzas, Nikolina A. Travlou, Eleni A. Deliyanni

Laboratory of General & Inorganic Chemical Technology, Division of Chemical Technology, School of Chemistry, Aristotle University of Thessaloniki, GR–541 24 Thessaloniki, Greece

ABSTRACT

The current work investigates the role of magnetic chitosan (CSm) to the adsorption of mercury(II) from effluents. Mercury is one of the most toxic heavy metals since it is not biodegradable and causes a lot of toxic effects in the human body. Many possible interactions between CSm and Hg(II) were observed after adsorption and explained via characterization with various techniques (SEM/EDAX, FTIR, XRD, DTG). The adsorption evaluation was done studying various parameters as the effect of pH (both in adsorption and desorption), contact time (pseudo–second order fitting), temperature (isotherms at 25, 45, 65 °C).

MERCURY ADSORPTION ONTO MAGNETIC CHITOSAN

George Z. Kyzas, Nikolina A. Travlou, Eleni A. Deliyanni

Division of Chemical Technology, Department of Chemistry, Aristotle University of Thessaloniki, Greece

State of the problem

Mercury is one of the most toxic heavy metals since it is not biodegradable and causes a lot of toxic effects in the human body. Its presence is due to a combination of natural processes (volcanic action, erosion of mercury–containing sediments) and anthropogenic activities (mining operations, tanneries, metal plating facilities) as well.

Chitosan as adsorbent

Chitosan (poly–β–(1->4)–2–amino–2–deoxy–D–glucose) is an amino–polysaccharide and cationic polymer produced by the N–deacetylation of chitin. It can be characterized as one of the most naturally abundant and cheap biopolymers. It is a hydrophilic, nontoxic, biodegradable, and biocompatible material with ability to form complexes with metals. The latter could be easily explained by the presence of amino groups on the polymer matrix, which can interact with metal ions of the solution by ion exchange or other complexation reactions (mainly chelation). Chitosan has been repeatedly characterized as a super metal adsorbent (Cu(II), Cd(II), Pb(II), Ni(II), Hg(II), Cr(VI), U(VI), Mo(V), V(V), Pd(II), Pt(IV), Au(III), As(V), Se(V)) presenting significantly high adsorption capacities (0.2–8.0 mmol/g).

Synthesis of Magnetic Chitosan (CSm)

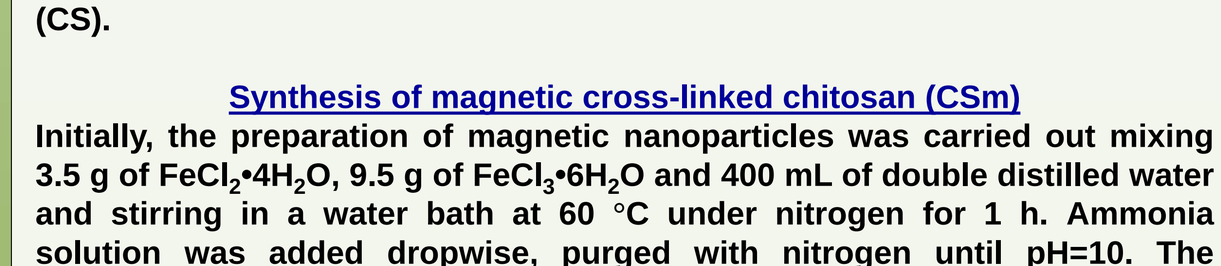
Synthesis of cross-linked chitosan (CS)

2 g of CSp was dissolved in 400 mL of acetic solution (2% v/v). Then, 15 mL of GLA (approximately 2:1 aldehyde groups (–CHO) of GLA per initial amino groups (–NH2) of chitosan) were added into the reaction flask to mix with the solution and was vigorously stirred at 25 °C for 3 h. The precipitate was washed with ethanol and distilled water in turn and dried in a vacuum oven at 45 °C. The obtained product was the cross–linked derivative of chitosan (CS).

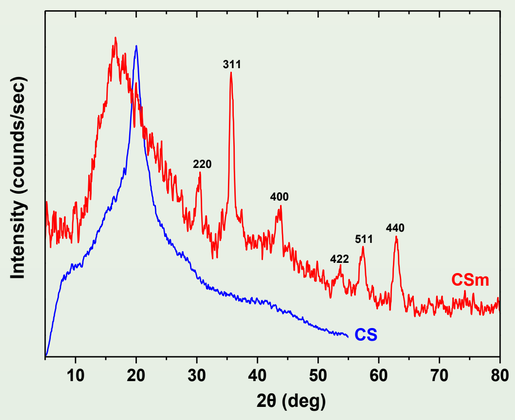
Synthesis of magnetic cross-linked chitosan (CSm)

Initially, the preparation of magnetic nanoparticles was carried out mixing 3.5 g of $FeCl_2 \cdot 4H_2O$, 9.5 g of $FeCl_3 \cdot 6H_2O$ and 400 mL of double distilled water and stirring in a water bath at 60 °C under nitrogen for 1 h. Ammonia solution was added dropwise, purged with nitrogen until pH=10. The precipitate obtained was decanted in a dialysis tubing cellulose membrane and the latter was placed in a bath filled with distilled water. The chloride ions presented in the initial suspension were slowly removed by osmosis through the membrane. The existence of Cl^- ions in the water bath was tested with a solution of $AgNO_3$ (0.1 M). The water of the bath was replaced several times, until no more chloride ions were detectable in it. The resulting cake on the membrane surface after decanting was freeze–dried in a bench freeze drier.

2 g of CSp was dissolved in 400 mL of acetic solution (2% v/v). 0.75 g of the prepared magnetic nanoparticles were added in the above chitosan solution and the mixture was sonicated for 30 min. Then, GLA was added to mixture solution in order to cross–link chitosan. So, 15 mL of GLA (similarly as CS, the ratio was 2:1 aldehyde groups (–CHO) of GLA per initial amino groups (–NH_2) of chitosan) were added into reaction flask to mix with the solution and was vigorously stirred at 60 °C for 2 h. The precipitate was washed with ethanol and distilled water in turn and dried in a vacuum oven at 50 °C. The obtained product was the magnetic cross–linked chitosan derivative (CSm).

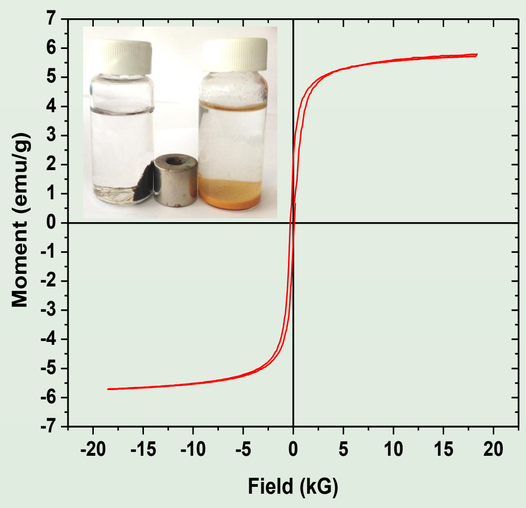


SEM images of CS, CSm, Fe distribution map



In the X–ray diffraction spectrogram of CS, a broad peak at 2θ=20.2° is presented due to the amorphous state of chitosan. In the spectrogram for the magnetic sample (CSm), the six characteristic peaks of Fe_3O_4 at 2θ = 30.1°, 35.5°, 43.3°, 53.4°, 57.2°, and 62.5°, attributable to the indices (220), (311), (400), (422), (511), and (440), respectively, were observed.

The results showed that chitosan binding did not result in a phase change in the structure of the magnetic nanoparticles. The patterns of CSm also exhibited a broad peak at 2θ = 20.3° due to the presence of chitosan.



The VSM plot showed a value of 5.79 emu/g for the saturation magnetization of CSm. This value is far less than that reported for pure magnetite colloidal nanocrystals (36.941 emu/g), but it may be due to the rather small size and the relatively low amount of Fe_3O_4 loaded on CSm. The magnetic property remained high enough for a magnetic separation to be achieved. Using an external magnetic field, CSm could be easily separated.

Adsorption experiments

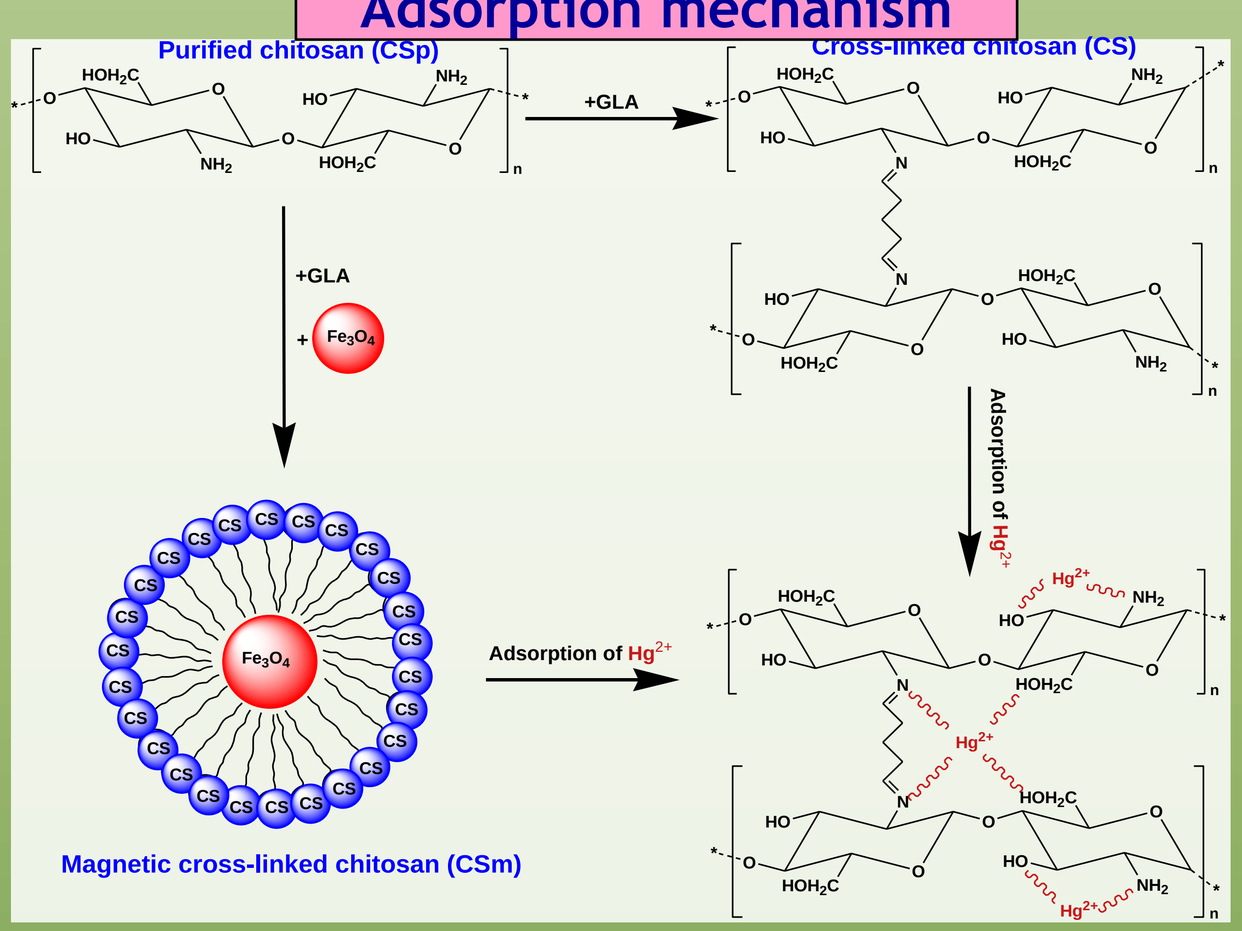
The effect of pH on adsorption was conducted by mixing 0.02 g of adsorbent with 20 mL of metal aqueous solution (C0,Hg(II)=100 mg/L). The suspension was shaken for 24 h (N=160 rpm) into a water bath to control the temperature at 25 °C (Julabo SW–21C). The optimum pH selected was 5.

Kinetic experiments were performed by mixing 0.02 g of adsorbent with 20 mL of metal aqueous solution (C0,Hg(II)=100 mg/L). The suspensions were shaken for 24 h at pH=5 in water bath at 25 °C (N=160 rpm). Samples were collected at fixed–time intervals (from 5 min to 24 h). Pseudo–first, pseudo–second order and Elovich equations were used to fit the kinetic experimental data.

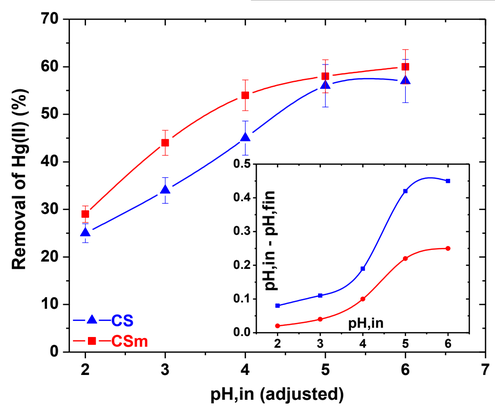
The effect of temperature on adsorption was determined by mixing 0.02 g of adsorbent with 20 mL of metal aqueous solutions of different initial concentrations (C0,Hg(II)=0–500 mg/L). The suspensions were shaken for 24 h at pH=5 in water bath at 25, 45, 65 °C (N=160 rpm). The resulted equilibrium data were fitted to the Langmuir model and Freundlich equation.

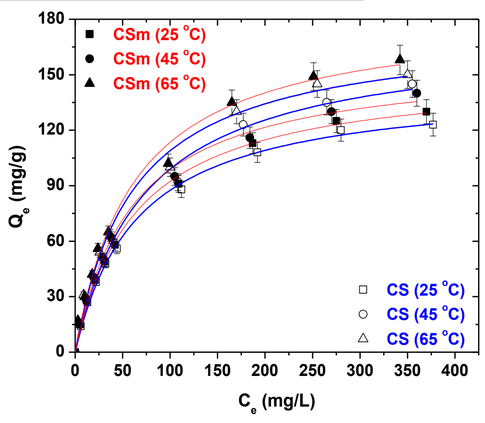
The desorption of Hg(II) from synthesized chitosan adsorbents was also investigated. Before desorption, adsorbents have to be loaded in an adsorption step. In this stage (adsorption), 0.02 g of adsorbent were added in conical flasks with 20 mL of 100 mg/L Hg(II) at pH=5. The agitation rate was 160 rpm and the contact time was 24 h at 25 °C. Afterwards, the samples were collected and filtered, using fixed pore–sized membranes. Desorption experiments were carried out by mixing the collected, after adsorption, amount of Hg(II)–loaded chitosan adsorbents (0.02 g) with metal aqueous solutions of 20 mL (same volume as in the adsorption step) over a pH range between 2 and 6, at 25 °C for 24 h (N=160 rpm).

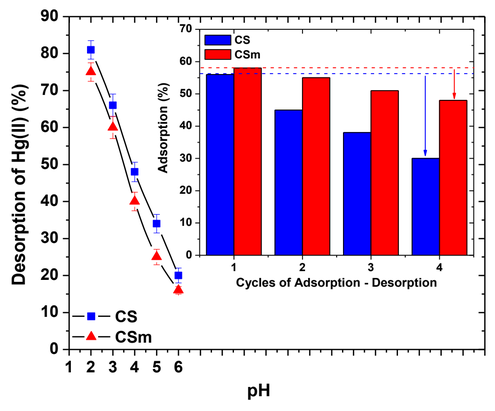
Adsorption mechanism

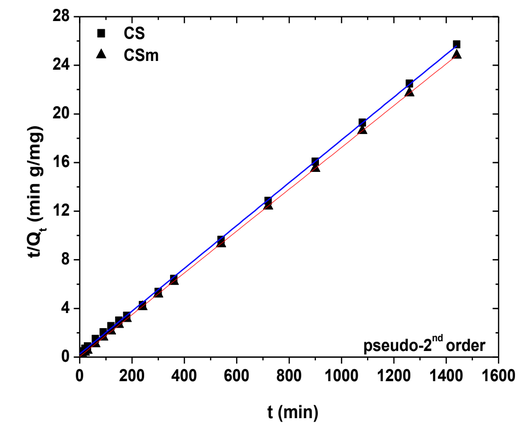


Adsorption results









Adsorbent	Langmuir equation				Freundlich equation		
	T (°C)	Q_{max} (mg/g)	K_L (L/mg)	R^2	K_F ($mg^{(n-1)/n}$ $L^{1/n}$ g^{-1})	n	R^2
CS	25	145	0.015	0.998	10.95	2.37	0.977
	45	171	0.014	0.992	10.93	2.22	0.976
	65	175	0.017	0.989	13.86	2.89	0.976
CSm	25	152	0.016	0.996	11.57	2.37	0.972
	45	158	0.017	0.994	12.54	2.39	0.988
	65	184	0.017	0.991	13.72	2.32	0.976

Conclusions

The main adsorption mechanism between amino groups of chitosan and mercury(II) ions were explained via characterization with various techniques. SEM/EDAX, FTIR, XRD, DTG, DTA, VSM, swelling tests). The optimum pH for adsorption was 5 and for desorption was 2. CSm presented faster adsorption than CS, while its Q_{max} at 25 °C was 152 mg/g (145 mg/g for CSm). Increasing the temperature, an increase of Q_{max} was observed for both derivatives. The reuse ability of the adsorbents prepared was confirmed with sequential cycles of adsorption–desorption. The reuse ability of CSm is very high since even after the 4th cycle the reduction of the adsorption ability was 10% (26% for CS).

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