**РЕЮМЕТА НА НАУЧНИ ПУБЛИКАЦИИ**

**на д‑р Диляна Звездова**

1. **Звездова, Д. Т**., А. Звездов, Органични биополимерни и полимерни сорбционни материали, структурни характеристики и тяхната значимост при различни инженерни технологии., И-во “*Libra Scorp*”, Бургас 2014, 284 стр.
2. [Velyana Georgieva](http://link.springer.com/search?facet-author=%22Velyana+Georgieva%22), [**Dilyana Zvezdova**](http://link.springer.com/search?facet-author=%22Dilyana+Zvezdova%22)**,** [Lyubomir Vlaev](http://link.springer.com/search?facet-author=%22Lyubomir+Vlaev%22), Non-isothermal kinetics of thermal degradation of chitosan, *Chemistry Central Journal 2012, 6:81.*

**Abstract** Thermogravimetric studies of chitin in air atmosphere were carried out at six rates of linear increase of the temperature. The kinetics and mechanism of the thermal decomposition reaction were evaluated from the TG data by iso-conversional calculation pro­cedure of Kissinger-Akahira-Sunose recommended from ICTAC kinetics committee, as well as 27 mechanism functions. The comparison of the results obtained showed that they strongly depend on the selection of proper mechanism function for the process. Therefore, it is very important to determine the most probable mechanism function. In this respect, the iso-conversion calculation procedure turned out to be the most appropriate one. In the present work, the values of the apparent activation energy E, pre-exponential factor A in Arrhenius equation, as well as the changes of entropy DS=, enthalpy DH=, and Gibbs free energy DG= for the formation of the activated complex from the reagent are calculated. All the calculations were performed using programs com­piled by ourselves.

**Keywords** Chitin • Thermal degradation • Non-isothermal kinetics • Kinetics triplet

1. [Velyana Georgieva](http://link.springer.com/search?facet-author=%22Velyana+Georgieva%22), [**Dilyana Zvezdova**](http://link.springer.com/search?facet-author=%22Dilyana+Zvezdova%22)**,** [Lyubomir Vlaev](http://link.springer.com/search?facet-author=%22Lyubomir+Vlaev%22) (2013). Non-isothermal kinetics of thermal degradation of chitin, [*Journal of Thermal Analysis and Calorimetry*](http://link.springer.com/journal/10973), **111**, [1](http://link.springer.com/journal/10973/111/1/page/1), 763-771.

Abstract

Background: Chitosan is the second most abundant nitrogen containing biopolymer in nature, obtained from the shells of crustaceans, particularly crabs, shrimp and lobsters, which are waste products of seafood processing industries. It has great potential application in the areas of biotechnology, biomedicine, food industries, and cosmetics. Chitosan is also capable of adsorbing a number of metal ions as its amino groups can serve as chelation sites. Grafted functional groups such as hydroxyl, carboxyl, sulfate, phosphate, and amino groups on the chitosan have been reported to be responsible for metal binding and sorption of dyes and pigments. The knowledge of their thermal stability and pyrolysis may help to better understand and plan their industrial processing.

Results: Thermogravimetric studies of chitosan in air atmosphere were carried out at six rates of linear increasing of the temperature. The kinetics and mechanism of the thermal decomposition reaction were evaluated from theTG data using recommended from ICTAC kinetics committee iso-conversional calculation procedure of Kissinger-Akahira-Sunose, as well as 27 mechanism functions. The comparison of the obtained results showed that they strongly depend on the selection of proper mechanism function for the process. Therefore, it is very important to determine the most probable mechanism function. In this respect the iso-conversional calculation procedure turned out to be the most appropriate.

Conclusion: Chitosan have excellent properties such as hydrophilicity, biocompatibility, biodegradability, antibacterial, non-toxicity, adsorption application. The thermal degradation of chitosan occurs in two stages.

The most probable mechanism function for both stages is determined and it was best described by kinetic equations of n-th order (Fn mechanism). For the first stage, it was established that n is equal to 3.0 and for the second stage - to 1.0 respectively. The values of the apparent activation energy E, pre-exponential factor A in Arrhenius equation, as well as the changes of entropy A5p enthalpy AH^ and free Gibbs energy AG^ for the formation of the activated complex from the reagent are calculated.

Keywords: Chitosan, Thermal degradation, Non-isothermal kinetics, Kinetics triplet

1. **Zvezdova, D. T.,** Georgieva, V. G., & Vlaev, L. T. (2012). Comparative study of chitin and chitosan. *Oxidation Communications*, *35*(3), 611-618.

The structure of p-substituted phenyl 2-nitrovinyl sulfones was studied through different spectral meth¬ods. It has been found that the nucleophilic substitution reactions of sodium phenylsulfinates with 1-chloro-2-nitroethene occur stereospecifically. The formation of E-isomers of this type of substituted phenyl vinyl sulfones was confirmed by FTIR and NMR spectroscopy. It was suggested that the .E-isomers formation was determined by the more stable conformation of the carbanionic intermediate as a result of intramolecular rotation around single Ca-C/З bond. This appears to be the product-determining pathway during the interaction of sodium phenyl sulfinates with the highly activated substrate 1-chloro-2- nitroethene.

Keywords: Sulfinate S-vinylation; Phenyl 2-nitrovinyl sulfones; Nucleophilic vinylic substitution; Substituent effects; E-isomers.

1. **Zvezdova, D.,** Stoeva, S., & Aleksiev, D. (2016). Structural Features of Certain p‐substituted Phenyl 2‐nitrovinyl Sulfones. *Journal of the Chinese Chemical Society*, **63,**247-253.

A conical one body multi cell, multistage water treatment filtration devices are designed to realize a couple of different processes. Their properties can be used for different technological processes (filtration, ion-exchange, active carbon sorption, etc.). As an example, the devices are studied experi­mentally for effective technological removal of organic contaminants (phenols) from water using polymeric adsorbents, strong-base anion exchange and active carbon sorption materials. These attempts to combine three processes in one filtration body did show successful results, while the small water treatment devices still being affordably priced. The main contribution of these devices is that they have very compact simple design, simple operative procedures, reduced quantity of valves for treated water and reagent flow regulation. The conical shape of the conical one body multi cell multistage water treatment filtration device ensures linear flow rate to slow down on its path. This hydraulic phenomenon plays a positive role during the sorption processes. The devices could be used as a small water treatment module for local drinking water treatment, etc..

Keywords: Phenol removal; Small water treatment device; Multistage filter; Multi cell filter

1. **Zvezdov, A. T.,** El Shemeri, A., & Zvezdova, D. T. (2009). Phenol removal multi cell small water treatment device. *Desalination and Water Treatment*, *12*(1-3), 299-304.

A decomposition thermal analysis of crab shells chitosan from shrimp on the Black Sea was carried out. The destruction processes of a complex solid-phase were researched. The correlation dependencies for approximate solution of Arrhenius integral were applied to the study of kinetics of destruction. It was used a complex criterion to assess the quality of the decomposition. To assess the accuracy of decomposition was used a complex criterion. The results led us to assume that the real adequacy is achieved by decomposition of five subs. The results of identification of digestion were analyzed.

Keywords: Non-isothermal kinetic study, Chitosan from shrimp, Complex processes, Complex method, Decomposition of the single sub-model.

1. **Звездова Д. Т**., Н. М. Неделчев, Получаване и неизотермичен кинетичен анализ на хитозан от скариди от Черно море. *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2015, **5**, 4, 100-106.

***Synthesis and thermogravimetric properties of crosslinked chitosan with black rice husks:*** *The particles of templated crosslinked chitosan (CS)-black rice husks ash (BRHA),* was *prepared through using epichlorohydrin (ECH) as a crosslinker. FTIR spectroscopy studies showed that the possible pathways for crosslinked CS-BRHA particles may include ion-ion interactions and hydrogen bond formation. A decomposition thermal analysis of the crosslinked chitosan (CS-BRHA-ECH)* was *carried out. The destruction processes of a complex solid-phase were researched. The method of non-isothermic thermogravimetry* was *applied for this purpose. The data show that most relevant results are obtained by separating the complex process into four elementary processes. The data obtained allowed several general conclusions for high thermal stability.*

***Key words:*** *crosslinked CS-BRHA-ECH, FTIR spectroscopy, non-isothermal TG kinetic study, thermal stability.*

1. Звездова Д. Т., Н. М. Неделчев, Синтез и термогравиметрични свойства на омрежен хитозан с черни оризови люспи. *Научни Трудове на Русенския Университет* – 2015, 54, 10.1, 223-228.

A new correlations for the Arrhenius integral has been proposed using the regression analysis, which is both reliable and accurate. Compared with several most often used Arrhenius integral approximations, the newly proposed correlations are superior to the others and are an ideal solution or the estimation of kinetic parameters from nonisothermal thermogravimetric analysis data.

***Keywords:*** *Arrhenius integral; Nonisothermal kinetics; Kinetic parameters; Rergesion corelation formulas*

1. Неделчев, Н. M., **Д. Т. Зведова**, Нови корелации за приблизително решаване на интеграла на Arrhenius и прилагането им при изследване на кинетиката на неизотермична деструкция. Част 1. Корелационни зависимости. *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora,* 2014, **4**, 129-134.

The correlation dependencies for approximate solution of Arrhenius integral, developed in Part 1, were applied to the study of kinetics of destruction of simple and complex processes.A multivariate test example, which includes from one to three sub-processes was developed.The advantages of the suggested approximations were proved. An approach to determine the number of sub-processes in a complex process was developed. The method was applied to decompositional identification of chitin from sea crabs. Kinetic models with high level of adequacy were obtained.

***Key words:*** *Arrhenius integral; Nonisothermal kinetics; Complex processes; Chitin; Kinetic decomposition*

1. **Звездова Д. Т.,** Н. М. Неделчев., Нови корелации за приблизително решаване на интеграла на Аrrhenius и прилагането им при изследване на кинетиката на неизотермична деструкция. Част 2. Корелационни зависимости*. Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2014**, 4**, 67-72.

***Synthesis, kinetic analysis and thermal stability of the crosslinked chitosan-epichlorohydrin:****The nanoparticles of templated crosslinked chitosan,* was *prepared through using epichlorohydrin (ECH) as a crosslinker. A decomposition thermal analysis of the crosslinked chitosan-epichlorohydrin (CTS-ECH)* was *carried out. The destruction pprocesses of a complex solid-phase were researched. The method of non­isothermic thermogravimetry* was *applied for this purpose. The data show that most relevant results are obtained by separating the complex process into five sub-processes. The data obtained allowed several general conclusions for high thermal stability.*

***Key words:*** *synthesis, crosslinked chitosan-epichlorohydrin, non-isothermal TG kinetic study, thermal stability.*

1. **Звездова, Д.Т**., Н.М.Неделчев. Синтез, кинетичен анализ и термична стабилност на омрежен хитозан-епихлорохидрин. *Научни Трудове на Русенския университет* – 2014, **53**, серия 10.1, стр.204-209.

Preparation, characterization and adsorption properties of chitosan nanoparticles for congo red as a model anionic direct dye: The present study dealt with the adsorption of congo red (CR), as a model anionic dye, from aqueous solution using chitosan nanoparticles. The particles of templated crosslinked chitosan-epichlorohydrine-CR, was prepared through the imprinting process using CR dye as а template and ECH as a crosslinker. The nanoparticles were characterized by FTIR spectroscopy. A batch system was applied to study the adsorption of CR from aqueous solution by chitosan nanoparticles. The results show that the adsorption of CR on imprinting chitosan nanoparticles was affected by contact time, CR concentration, pH and temperature. The results are in accordance with the second-order adsorption model.

Key Words: Adsorption, Congo Red, Crosslinked-chitosan epichlorohydrine, FTIR-spectroscopy.

1. **Zvezdova D.**, Preparation, characterization and adsorption properties of chitosan nanoparticles for congo red as a model anionic direct dye, *Научни Трудове на Русенския университет* – 2014, **53**, 10.1, 83-87.

A new method of decomposition, identification and parameterization for the analysis of the kinetics of parallel, consecutive and mixed processes of destruction of solid-phase systems was developed. The results of the method are S differential kinetic models of all constituent sub-processes *fk(a),* activating energies Ek, pre-exponential coefficients Ak, weight coefficients*wk* and thermic parameters AH^, AS^ и AG^ (k=1,2,..Sp). The method was tested with an especially developed example of a system of two parallel sub-processes. The high rate of repetition of the test data confirms the reliability of the approach.

***Keywords:*** *Non-isothermal kinetic study, Complex processes, Differential method, Splitting of complex stage*

1. Неделчев,Н.М., Д**.T.Звездова**. Директен диференциален метод за изследване кинетиката на деструкция на сложни твърдофазни процеси с данни от не­изотермична термогравиметрия. *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora,* 2013, **3**, 4, 66-74.

A decomposition thermal analysis of crab shells chitosan commercially obtained from SIGMA-ALDRICH was carried out. The destruction processes of a complex solid-phase were researched. The method of non-isothermic thermogravimetry was applied for this purpose. The data obtained on the basis of this direct differential method for analysis of the destruction kinetics of complex solid-phase show that most relevant results are obtained by separating the complex process into three sub-processes. The advantage of the direct differential thermogravimetry method compared to the direct integral method was shown

***Keywords:*** *Non-isothermal Kinetic study, Chitosan, Complex processes, Differential method, Splitting of stage*

1. **Звездова, Д.Т**., Н.М.Неделчев. Неизотермичен кинетичен анализ на термич­ното разпадане на хитозан чрез директен диференциален метод за изслед­ване сложни твърдофазни процеси. *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2013, **3**, 4, 139-145.

***Kineticanalysisof the thermaldestructionof chitosanusing modelswith distributedactivationenergy model:*** *Decomposition thermal analysis of chitosan derived from chitin* was *carried out. The decomposition of a complex process solid-phase* was *researched.*

*The method of non-isothermal thermo gravimetric study* was *applied for this purpose. Pseudo iso­conversion (PIC) non-isothermal approaches with the most popular methods were applied for investigation of the activation energy and suitable number of sub processes. The data obtained on the basis of the DAEM- Complex approach and Complex criteria show that most relevant results are obtained by separating the complex process into nine sub-processes.*

***Key words:****Chitosan,non-isothermal TG study,DAEM-Complex approach, Complex criteria.*

1. **Звездова Д**., Н. Неделчев, Кинетичен анализ на термичната деструкция на хитозан с използване на модели с разпределена активираща енергия, *Научни Трудове на Русенския университет* – 2013, **52**, 10.1, 214-218.

**Conditionig technology for natural water treatment befor their memrane treatment:** A

semyiindustrial technological water conditioning plant is created in order to treat the natural water for reverse osmosis, nanofiltration or ultrafiltration treatment.The experimental results show that the technological scheme is suitable for the purpose defined. The water produced should be treated by means of membrane plants without any probability to block membrane surfaces by scaling or fouling phenomenon.

Key words: Membrane Scaling, Fouling Phenomenon, Organic Humus Substances, Natural Water, Reverse Osmosis, Nanofiltrartion, Ultrafiltration

1. **Звездова Д**., Ст.Павлова, Технология за кондициониране на природни води преди мембранната им обработка, *Научни Трудове на Русенския университет* – 2013, **52**, 10.1, 208-213.

***Abstract:****The nanoparticles of templated crosslinked chitosan,* was *prepared through using ECH as a crosslinker. The nanoparticles exhibited significantly higher adsorption capacities from the congo red dye than other adsorbent formed without a crosslinker. The adsorption of the dyes on the nanoparticles* was *affected by the initial pH, dye concentration, and temperature. The results were in accordance with the second-order adsorption models. The Ea values of the dyes calculated using the Arrhenius's equation revealed that the adsorption process may be due to the dual nature of the process, physisorption and chemisorption, and that adsorption was predominant in the chemisorption process. The adsorption processes in the nanoparticles were spontaneous and exothermic.*

***Keywords:*** *Adsorption kinetics, Congo Red, Crosslinked Chitosan-ECH nanoparticles.*

1. **Dilyana Zvezdova,** Svetlana Georgieva, Kinetic and equilibrium studies on the removal of Congo red from aqueous solution by biosorption on crosslinked chitosan*-, Научни трудове на Русенския университет* -  *2013*, **52**, 10.1, 72-77.

***Abstract:****The nanoparticles of templated crosslinked chitosan,* was *prepared through using ECH as a crosslinker. The nanoparticles exhibited significantly higher adsorption capacities from the congo red dye than other adsorbent formed without a crosslinker. The adsorption of the dyes on the nanoparticles* was *affected by the initial pH, dye concentration, and temperature. The results were in accordance with the second-order adsorption models. The Ea values of the dyes calculated using the Arrhenius's equation revealed that the adsorption process may be due to the dual nature of the process, physisorption and chemisorption, and that adsorption was predominant in the chemisorption process. The adsorption processes in the nanoparticles were spontaneous and exothermic.*

***Keywords:*** *Adsorption kinetics, Congo Red, Crosslinked Chitosan-ECH nanoparticles.*

1. **Звездова, Д. Т**, Е. Н. Сотирова, Н. M. Неделчев (2013). Неизотермичен кинетичен анализ на термичното разпадане на хитозан от раци от Черно море. *Годишник на Университет “Проф. д-р Асен Златаров” Бургас*, **42**, 1, 21-26.

Decomposition thermal analysis of chitosan derived from the chitin of Black Sea crabs was carried out. The decomposition of a complex process solid-phase was studied. The method of non-isothermal thermogravimetry was applied for this purpose. А complex optimization criterion in which the decomposition is most accurate was developed. The data obtained on the basis of the Complex method and Complex criteria show that the most relevant results are obtained by separating the complex process into four sub-processes. The advantage of the direct Complex thermogravimetry method compared to other methods was shown. The results of the decomposition identification were analyzed.

Key words: Chitosan, non-isothermal TG study, Complex method, Complex criteria.

1. **Звездова, Д. Т**, С. Стоева, (2012). Определяне на степента на деацетилиране на хитозан чрез потенциометрично титруване. *Университет “Проф. д-р Асен Златаров” Бургас, Конференция управление и образование, Годишник на Университет “Проф. д-р Асен Златаров” Бургас*, **8**, 4, 127-130.

ABSTRACT: The degree of deacetylation of chitosan was determined using the method ofpolentiometric ti- tranon, combined with enzymatic pre-treatmen, of samples. The chitosan used was prepared by deacetylation of chitin isolated from crab and shrimp shells from the Black Sea. It was found that the average degrees ofdeacetv- iation of chitosan from crabs and shrimps were 81.61% and 82.30% respectively. They are commensurable with the degrees of deacetylation of commercial chitosan, which is important for the practical use of chitosan, pre­pared from our own raw materials. y

Key words: Chitosan, Degree of Deacetylation, Potentiometric titration.

1. **Звездова, Д. Т**, Хр. Узов, (2012). Определяне на степента на деацетилиране на хитин и хитозан чрез ренгеноструктурен анализ. *Университет “Проф. д-р Асен Златаров” Бургас, Конференция управление и образование, Годишник на Университет “Проф. д-р Асен Златаров” Бургас*, **8**, 4, 85-89.

*ABSTRACT*: *A new method to determine the degree of deacetylation (DD) of a-chitin and chitosan in the range of80-94% DD using X-ray powder diffraction (XRD) is proposed The results were calibrated using 1H NMRspectroscopy for chitosan and FTIR for chain. The results showed a good linear correlation between the CrI020from XRD and the calibrated DD value. This method is found to be simple, rapid cmd nondestructive to the sample.*

*Key words-. Degree of deacetylation; Chitin; Chitosan; X-ray powder diffraction*

1. **Zvezdova D.,** N. M. Nedelchev, Pseudo iso-conversion non-isothermal approaches for study of kinethic of degradation of chitin from Black Sea marine crabs, . *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2012, **2**, 4, 15-21.

On the basis of the general kinetics equation of solid-state reaction pseudo iso-conversion (PIC) non-isothermal approaches are applied for investigation of the kinetic model app parameters of degradation of chitin. The approaches are based on differential and integral iso­conversion method and allow determining the most adequacy kinetic model.

By means of simultaneous thermal analysis, with the use of STA 449 F3 Jupiter (Netzsch - Germany), an investigation of the kinetics of chitin dynamic decomposition has been conducted. The results are compared with those obtained by other methods, which indicates the correct approach of investigation and the desired accuracy of results.

Key words: pseudo iso-conversion non-isothermal kinetic analysis, velocity of conversion, thermogravimetry, chitin

1. Milina, R., Mustafa, Z., Stanev, S., **Zvezdova, D.,** & Stoeva, S. (2012). Headspace gas chromatographic analysis of Bulgarian Lavandula Angustifolia mill Herbs. I. optimization of the analysis conditions. *Научни Трудове На Русенския Университет (Scientific Works of The University (Bulgarian)*, *51*(9.1), 50-56.

**Abstract:** An analytical method for evaluation of Lavandula angustifolia Mill herbs is proposed. The method consists of quick extraction and simultaneously determination of volatile components using headspace gas chromatography (HS-GC). Some HS parameters were experimentally considered to maximizing the signal and sensitivity and minimizing the relative standard deviation of the results: weight of sample in the headspace vial, the time of the headspace oven (sample equilibration time) and the temperature of the oven. The evaluations were made using 7 Bulgarian kinds of herb. Using our earlier developed GC-MS method of qualitative and quantitative analysis of lavender essential oils, some tests were carried out to determine the contents of volatile components in the headspace gas of the herbs. Preliminary results for the main components are given.

**Key Words:** headspace, Lavandula angustifolia Mill,gas chromatography, herb.

1. **Zvezdova, D**., Stoeva, S., Mustafa, Z., Milina, R., & Zvezdov, A. Comparison of biosorption of Congo red on the templated cross-linked chitosan nanoparticles. *Трудове На Русенския Университет (Scientific Works of The University (Bulgarian)*, *51*(9.1), 90-95

***Abstract:*** *The nanoparticles of templated crosslinked chitosan-epichlorohydrin and chitosan- epichlorohydrin -Congo Red, were prepared through the imprinting process using Congo Red dye as template and epichlorohydrin as a crosslinker. The nanoparticles exhibited significantly higher adsorption capacities of the dye than other nanoparticles formed without a dye template and with crosslinker epichlorohydrin. FTIR spectroscopy studies showed that the possible pathways for Congo Red adsorption onto crosslinked chitosan particles may include ion-ion interactions and hydrogen bond formation.*

***Key Words:*** *biosorption, Congo Red, templated crosslinked-chitosan, FTIR-spectroscopy.*

1. **Zvezdova, D**., Non-isothermal kinetic study of thermal degradation of chitin from shrimp shell from Black Sea,  *Annual Assen Zlatarov University, Bulgaria Bourgas, XLI, 2012, No 1, 35-41.*

*Chitin has been extracted from Black Sea shrimp shells, using original technology, and thermogra-vimetric studies were conducted under air atmosphere. For the purpose of kinetic studies, preliminary “smoothing” the TG-experimental data was performed by employing a two-way filter method. The kinetic mechanism and the corresponding parameters were evaluated from the TG data by using iso-conversional and pseudo-iso-conversional calculation approaches of Kissinger-Akahira-Sunose (KAS). Moreover, 34 known kinetic and 3 generalized functions were used for the whole analysis. The optimal exponent factor of the generalized models was determined by employing the golden section method*

***Key words****: Chitin, thermal degradation, KAS-method, kinetic parameters*

1. **Звездова, Д**. Изследване адсорбционните свойства на някои стирен­дивинилбензен и акрилатни синтетични полимерни смоли при обезцветяване на водни разтвори *Annual Assen Zlatarov University, Bulgaria Bourgas, XLI, 2012, No 1, 42-47.*

*The adsorption of water soluble dye Congo Red onto synthetic polystyrene-matrix and acrylic ester matrix has been investigated. The effect of the total porosity, specific surface area and pore size distribution of resins is ascribed to the different mechanophyisical porous and chemical structures. Adsorption characteristics and mechanism of styrene resins and acrylic ester resins are compared. The adsorption properties of polyreticular strong base ion-exchange resins exhibit the most excellent behavior toward dye recovering from water solutions.*

***Key words****: dye removing; Congo Red; adsorption; adsorbent porosity; ion-exchange resins*

1. **Звездова, Д**. А. Звездов, Метод за пречистване на моделен воден разтвор от оцветител конго червено чрез хитозан, *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2012, **2**, 4, 37-41.

The process of sorption is being increasingly used for ecofriendly and economic

remediation of textile dye effluents. The present model study deals with the coagulation and

adsorption method of anionic dye (Congo Red) removal, from model colored water using

conditioned chitosan hydro-beads. Conditioning experiments the pH sensitivity maintained

between 4÷8.5. The maximum sorption capacity of the beads was near pH=8. To understand the chemicophysical characteristics of the adsorption process we studied, behavior of the batch system. It was observed that temperature and pH played a significant role in the process. The processes observed were parallel coagulation and adsorption on chitosan hydrobeads and on the floccules obtained. Actually the dye concen-tration in the water treated was reduced

approximately 46 times for a rather short period of 20 minutes. It is a very positive

technological efficiency.

***Key words:*** *Anionic dye, Chitosan beads, Congo red, Adsorbtion, Coagulation*

1. [**Zvezdova**](http://link.springer.com/search?facet-author=%22Dilyana+Zvezdova%22) **D.,** [V. Georgieva](http://link.springer.com/search?facet-author=%22Velyana+Georgieva%22), [L. Vlaev](http://link.springer.com/search?facet-author=%22Lyubomir+Vlaev%22), Non-isothermal kinetics of degradation of chitin and chitosan,. Трудове на Русенския университет (Scientific works of the university (Bulgarian) 2011, 50 (9.1), 13-17.

Abstract: Thermogravimetric studies of chitin and chitosan in air atmosphere were carried out at six rates of linear increase of the temperature. The kinetics and mechanism of the thermal decomposition reaction were evaluated from the TG data using recommended from ICTAC kinetics committee iso- conversional calculation procedure of Kissinger-Akahira-Sunose, as well as 27 mechanism functions. The values of the apparent activation energy E, pre-exponential factor A in Arrhenius equation, as well as the changes of entropy AS\*, enthalpy AH\* and Gibbs free energy AG\* for the formation of the activated complex from the reagent are calculated.

Key words: Chitin and Chitosan, Thermal Degradation, Non-isothermal Kinetics, Kinetics Triplet

1. **Звездова Д.,** Ангел Звездов, Технологично съоръжение за обезцветяване на води,. Трудове на Русенския университет (Scientific works of the university (Bulgarian), (2011)р 50 (9.1), 187-191.

Abstract: A small locally used water treatment device universally applied has been researched. Its applications in the natural and wastewater treatment, based on different kinds of membrane modules or fitration materials loaded, have been tested, Its technological behavior during the process of water :decolourization, turbity, colloids,dye, hardnes, saltconten removal etc. has been researched.

Key words: Small water treatment device, hardnes, deionization, decolourization, chitosan, bio­polymer and polymer sorbents

1. **Звездова, Д.,** А.Звездов, Синтез, строеж и антибактериална активност на хитозан-Zn комплексни съединения. *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2011, **1**, 4, 56-61.

A method for preparation of four chitosan-Zn complexes with different content have been characterized by means of FTIR, XRD analytical methods. The different molecular structures and different molecular weights have been discussed depending on Zn-ions content. Antibacterial activities of these different complex substances have been in-vitro tested for a couple microorganisms and fungal. The investigated chitosan-Zn complexes show a wide range of effective antibacterial activities larger than pure chitosan or ZnCl2 respectivelly. The chitosan-Zn complexes have better antibacterial activity if Zn content is increased. The antibacterial activity against bacteria is better than those against fungal. An excellent activity is shown against Е. coli.

Key words: chitosan-Zn complexes, FTIR spectroscopy, Escherichia coli, Salmonella enteritidis, Staphylococcus aureus, Corynebacterium, Candida albicans

1. К. М. Gyurova, B. I. Bogdanov, N. M. Nedelchev, I. V. Petrova, **D. T. Zvezdova**, Application of a new approach for investigation of the kinetics of substance decomposition by means of non-isothermal thermogravimetry, *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2011, **1**, 4, 44-49.

Using thermal analyzer STA 449 F3 Jupiter (NETZSCH - Germany), thermogravimetric curves were obtained at several heating rates to study various decomposition processes: thermal decomposition of poly(ethylene oxide) (PEO) and dehydration of calcium oxalate monohydrate (COM). A new approach was applied in the mathematical processing of the data to calculate the apparent kinetic parameters and the most probable kinetic models of the summary thermochemical reactions. The average activation energy of thermal decomposition of PEO in nitrogen medium was found to be 192.2 kJ/mol at coefficient of correlation R2=0.9932 and most probable rate-determining model obeying the Avrami-Erofeev equation, g(a)= [-lg(1-a)]32.

For COM dehydration, the average value obtained was Еа=82.1 kJ/mol at R2=0.9939 for a kinetic model described by a power function g(a)=1-(1-a)1/2. The results obtained by the direct procedure suggested, without approximation, are comparable by value and precision to these obtained by well known methods.

Key words: non-isothermal thermogravimetry; decomposition kinetics, poly(ethylene oxide); Ca(COO)2.H2O.

1. **Zvezdova D**., A. Zvezdov, Magnetic chitosan microspheres preparation from black sea crabs and their use as a natural biopolymer adsorbent for color waste water treatment, *Int. Sci. on-line J., “Science & Tecnologies”, Stara Zagora*, 2011, **1**, 4, 29-33.

A method of preparation of magnetic chitosan microspheres (MCM) has been investigated. In addition, its applications in the wastewater treatment, based on different kinds of wastewater, have been researched, and their mechanisms have been discussed. The preparation of MCM was precipitation method developed based on the special solubility characteristics of chitosan: dissolved in acidic aqueous media but precipitated in alkali one. In a definite condition, regular microspheres would be formed by adding chitosan solution dropwise to alkali aqueous solution. The magnetic chitosan microspheres obtained are investigated for color waste water from paper and textiles industries. Their magnetic properties allow a good separation after the waste water purification processes. The results obtained show an effective use in waste treatment field.

Key words: chitosan microgranule, FTIR spectroscopy, water purification

1. **Zvezdova D**., Synthesis and characterization of chitosan from marine sources in Black Sea, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 49 (9.1), 65-69.

Abstract: Chitosan has been extracted from different marine crustacean from the Black Sea of Bulgarian Gulf. The contents of the various exoskeletons have been analyzed and the percent of the inorganic salt , protein, chitinand chitosan was determined. Deacetylation of the different chitin produced was conducted by the conventional thermal heating method. The chitosan was characterized by elemental analysis, FTIR measurements.

Key wards: Chitosan , demineralization, deprotenization,deacetylation, FTIR spectroscopy

1. **Zvezdova D**., A. Zvezdov, A filtration water treatment device for colored waste water treatment, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 49 (9.1), 27-32.

Abstract: The dsigns of technological small water water treatment sorption devices loadedwith magnetic chitosan microspheres have been researched. In addition, their applications in the wastewater treatment, based on different kinds of colored wastewater, have been tested, and their technological behaiviour during the process of dye removal have been discussed.

Kew words: magnetic chitosan microspheres, small water treatment device, applications in colomd wastewater treatment

1. **Zvezdova D**., Investigation of some physicochemical properties of chitin from crab shells, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 49 (9.1), 36-40.

Being considered to be materials of great futuristic potential with immense possibilities for structural modifications to impart desired properties and functions, research and development work on chitin has reached a status of intense activities in many parts of the world. The positive attributes of excellent biocompatibility and biodegradability with ecological safety and low toxicity with versatile biological activities have provided ample opportunities for further development. Because of this reason we have investigated some physicochemical properties of chitin by FTIR spectroscopy, X-ray, termogravimetric analysis.

Key wards: Chitin , FTIR spectroscopy, X-ray, Termogravimetric analysis

1. **Zvezdova D**., S. Stoeva, Isolation and characterization of chitin from marine sources in Black Sea, *Annual Assen Zlatarov University, Bulgaria Bourgas, XXXIX, 2010, No 1, 37-41.*

Chitin has been extracted from different marine crustacean from the Black Sea. The content of the various exoskeletons has been analyzed and the percent of inorganic salts, proteins and chitin were determined. The experimentally prepared chitins were characterized by FTIR spectroscopy. It was found that the secondary amide groups in the biopolymer were associated with trans-configuration of the corresponding structural fragments.

Key wards: Chitin, demineralization, deprotenization, FTIR spectroscopy

1. **Zvezdova D**., S. Manolov, S. Stoeva, Quantum-chemical study of p-substituted (E)-phenyl 2-nitrovinyl sulfones, *Annual Assen Zlatarov University, Bulgaria Bourgas, XXXVIII, 2009, No 1, 36-40.*

The geometric parameters of p-substituted (E)-phenyl 2-nitrovinyl sulfones were established by means of semiempirical quantum-chemical methods AM1,PM3, ZINDO/1 and ab initio STO-3G. Some important indexes of the compounds, reactivity and their vibrational spectra were calculated by using AM1 and PM3 methods. Their electronic spectra were also calculated by ZINDO/S method. A good correlation was found between some of the calculated indexes of sulfones, their absorbtion bands in IR-spectra and the electronic effects of the substituents.

Key words: phenyl 2-nitrovinyl sulfone, 4-tolyl 2-nitrovinyl sulfone, 4-methoxyphenyl 2-nitrovinyl sulfone, 4-chlorophenyl 2- nitrovinyl sulfone, 4-bromophenyl 2- nitrovinyl sulfone, 4-nitrophenyl 2- nitrovinyl sulfone, quantum-chemical calculations, geometry optimization

1. **Звездова Д.,** А. Звездов, Относно възможностите за пречистване на отпадъчни води от багрилни технологии чрез полимерни адсорбенти, (2009), (Scientific works of the university (Bulgarian), 48 (9), 114-119.

Application of synthetic polymer and biopolymer adsorbents in wastewater treatment has received considerable attention in recent years in the literature. In particular, the development of biopolymer adsorbtion materials as useful adsorbent polymeric matrices is an expanding field in the area of adsorption science. The literature review highlights some of the notable examples in the use of biopolymer adsorbents and its grafted and crosslinked derivatives for dye removal from aqueous solutions. This work summarizes the key advances and results that have been obtained in their decolorizing application as biosorbents.

Key words: dye removal, synthetic polymer adsorbents, biopolymer adsorbents, chitosan, grafted and crosslinked chitosan.

1. **D. Zvezdova**, V. Vasilev, S. Georgieva,Chitosan as antimicrobial agent: applications and mode of action,Шестнадесета юбилейна национална научна сесия за студенти и преподаватели 29 – 30.10.2018 г.

Chitosan, a hydrophilic biopolymer industrially obtained by N-deacetylation of chitin, can be applied as an antimicrobial agent. It highlights the applications of chitosan as an antimicrobial agent against fungi, bacteria, and viruses and as an elicitor of plant defense mechanisms. A series of novel chitosan-zeolite nanocomposite (CZN) films were prepared by using solvent casting method for wound healing application. The physicochemical properties namely thickness, folding endurance, water absorption capacity, and water vapour transmission rate (WVTR) of the films were studied. Fourier transform infrared spectroscopy (FTIR) was employed to ascertain the interaction between negatively charged zeolite and positively charged chitosan. Moreover, the antibacterial activity of the films was investigated against gram positive and gram negative. It was found that all CZN films showed good inhibitory activity against all the tested bacteria as compared to control. The above analysis suggested that the CZN films could be used as potential candidates for wound healing application.

1. **Dilyana Zvezdova,** N. Nedelchev, Kinetic studty of the thermal decomposition of hitosan-zeolite nanocomposite, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 2018, volume 57, book 10.1.,51-56.

***Abstract:*** *A decomposition thermal analysis of hitosan-zeolite nanocomposite (CZN) synthesized by the authors was conducted was carried out. A TG comparison between the product and the raw was made. The destruction processes of a complex solid-phase were researched. The correlation dependencies for approximate solution of Arrhenius integral were applied to the study of kinetics of destruction. It was used a genetic algorithm and complex criterion to assess the quality of the decomposition. The results led us to assume that the real adequacy were achieved by decomposition of five subprocessess. The results of identification were analyzed.*

***Keywords:*** *Non-isothermal kinetic study, Chitosan-zeolite nanocomposite, Complex processes, Genetic algorithm Complex method, Decompositio nto the single sub-model.*

1. **Dilyana Zvezdova**, I. Tankov, Valentin Vasilev, S. Georgieva, A. Veli , R. Nikolova,

Preparation and characterization of chitosan-zeolite nanocomposite films for wound healing application, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 2018, volume 57, book 10.1., 68-75.

***Abstract:*** *A series of novel chitosan-zeolite nanocomposite (CZN) films were prepared by using solvent casting method for wound healing application. The physicochemical properties namely thickness, folding endurance, water absorption capacity, and water vapour transmission rate (WVTR) of the films were studied. Fourier transform infrared spectroscopy (FTIR) was employed to ascertain the interaction between negatively charged zeolite and positively charged chitosan. The surface morphology of the prepared composite films was also studied by scanning electron microscopy (SEM). Due to strong hydrophilic nature of zeolite, it great lyenhances the water absorption capacities of the prepared nanocomposite films. In addition, the presence of zeolite in the said films also increases the mechanical strength. Moreover, the antibacterial activity of the films was investigated against gram positive and gram negative.The above analysis suggested that the CZN films could be used as potential candidates for wound healing application.*

***Keywords:*** *Chitosan-zeolite nanocomposite, Fourier transform infrared spectroscopy, Water absorption capacity, Water vapour transmission rate*

41. V. Ivanov1, N. Bozakova, V. Petrova-Tacheva, **D. Zvezdova**, V. Slavova, Study on the decontamination and dеstruction of chemical weapons through the use of simulants,

Trakia Journal of Sciences, Vol. 16, Suppl. 1, pp 147-149, 2018

Chemical weapons have been used repeatedly in the history of mankind in a number of wars and terrorist acts. They have caused serious damage on human health and taken many lives. In a number of cases, such as the development of antidotes against their action, doing research on their detection, also the development of sorbents for gas masks, and conducting military training, it is possible to use different simulants. These are compounds that resemble the action of the poisonous substances but lack such high toxicity. They are not so harmful to human life and health.

The purpose of this report is to explore the possibilities of using chemical warfare agents simulants to study their decontamination and destruction.

**Key words:** chemical warfare agent, tabun, sarin, soman, sulfur mustard

1. **Dilyana Zvezdova**, I. Tankov, St. Harkov, R. Nikolova, A. Veli, Preparation and characterization of chitosan-antibiotic-zeolite nanocomposite films, Annual of Аssen Zatarov university, burgas,bulgaria, 2018, v. XLVII (1), 67-72.

*A series of novel chitosan-anthibiotic-zeolite nanocomposite (CAZN) films were prepared for wound healing application by using the solvent casting method. Their physicochemical properties, namely thickness,folding endurance, water absorption capacity, and water vapour transmission rate (WVTR) were studied.Fourier transform infrared spectroscopy (FTIR) was employed to ascertain the interaction between the negatively charged zeolite and positively charged chitosan. Due to the strong hydrophilic nature of zeolite, it greatly enhances the water absorption capacities of the prepared nanocomposite films. In addition, the presence*

*of zeolite in the films also increases their mechanical strength.*

***Key words****: chitosan, zeolite, chitosan-tertsef-zeolite nanocomposite films, FTIR*

1. **Dilyana Zvezdova**, Applications of chitosan-sulfathiazole as antimicrobial agent**,** KNOWLEDGE – International Journal Vol. 28.2 December, 2018 , 429 –432.

**Abstract:** Chitosan, a hydrophilic biopolymer industrially obtained by N-deacetylation of chitin, can be applied as an antimicrobial agent. It highlights the applications of chitosan as an antimicrobial agent against fungi, bacteria, and viruses and as an elicitor of plant defense mechanisms. A series of novel chitosan-sulfathiazole nanocomposite (CSFZ) films were prepared by using solvent casting method for wound healing application. Fourier transform infrared spectroscopy (FTIR) was employed to ascertain the interaction between negatively charged sulfathiazole and positively charged chitosan. Moreover, the antibacterial activity of the films was investigated against gram positive and gram negative microorganisms. It was found that all CSFZ films showed good inhibitory activity against all the tested bacteria as compared to control. The above analysis suggested that the CSFZ films could be used as potential candidates for wound healing application.

**Keywords:** Chitosan-sulfathiazole nanocomposite, Escherichia coli, Bacillus subtilis

1. **Dilyana Zvezdova**, S. Georgieva, Preparation of chitosan- sulfathiazole films with potential biomedical applications, KNOWLEDGE – International Journal Vol. 28.2 December, 2018 , 433-439.

**Abstract:** A series of novel chitosan-zeolite-sulfathiazole nanocomposite (CSFZ) films were prepared by using solvent casting method for wound healing application. The physicochemical properties namely thickness, folding endurance, water absorption capacity, and water vapour transmission rate (WVTR) of the films were studied. Fourier transform infrared spectroscopy (FTIR) was employed to ascertain the interaction between negatively charged zeolite and positively charged chitosan. The surface morphology of the prepared composite films was also studied by scanning electron microscopy (SEM). Due to strong hydrophilic nature of zeolite, it great lyenhances the water absorption capacities of the prepared nanocomposite films. In addition, the presence of zeolite in the said films also increases the mechanical strength. The above analysis suggested that the CSFZ films could be used as potential candidates for wound healing application.

**Keywords:** Chitosan-zeolite-sulfathiazole nanocomposite, FTIR spectroscopy, Water absorption capacity, Water vapour transmission rate

1. **Dilyana Zvezdova**, S. Georgieva, Heliotherapy in the treatment of psoriatic arthritis**,** KNOWLEDGE – International Journal Vol. 28.2 December, 2018 , 483-487.

**Abstract**: Psoriatic arthritis is an inflammatory joint disease associated with psoriasis vulgaris, with routinely negative rheumatoid factors and the absence of rheumatoid nodules. This is an immune-mediated disease, according to generally accepted definition of Wright and Moll from 1973. American Association against Rheumatism classified psoriatic arthritis as an independent disease in 1964. Psoriatic arthritis is a single disease with a varied clinical picture. It belongs to the group of seronegative spondyloarthropathies with which there are general clinical features. It is believed that similar mechanisms determine the onset of psoriasis and psoriatic arthritis. The clinical picture includes various clinical forms that damage the peripheral and sacroiliac joints, spine, internal organs. The treatment of psoriatic arthritis is directed simultaneously to the influence of skin and joint changes. **Purpose:** Our study aims to summarize our long-standing experience in the treatment of psoriatic arthritis with heliotherapy. **Subject of observation:** Monitoring includes 132 patients with moderate and severe form of psoriasis treated at the sanatorium in town of Pomorie for 5 years in the period 2001-2006. **Results and discussion:** 132 patients with psoriasis with no effect on the local therapy and have proven psoriatic arthritis were selected. In our climatic conditions, heliotherapy is appointed during the warm half-year. Sun treatment was conducted under the conditions of a healing beach, which had shielding, radiation-protective devices. In patients with erythema - pigment and pigment type skin reactivity begins with 1-2 bioadoses reached to 8-10 biodoses, carried out in the area of overcomfort. **Conclusion:** The studies demonstrated that heliotherapy combined with medications significantly improves the prognosis of patients with this disease. The ultimate success would mean overcoming the frequent depression conditions, better survival and social comfort for patients with psoriatic arthritis.

**Keywords:** arthritis, psoriatic arthritis, heliotherapy

1. V. Pancheva, S. Georgieva, **D. Zvezdova,** Prevention of obesity as a risk factor for the development of diabetes mellitus and other socially significant diseases,KNOWLEDGE – International Journal Vol. 23.2 Budva, Montenegro, May, 2018, 585-591.

**Аbstract :** Diseases, which because of their high prevalence and the creation of serious medical and social problems are called socially significant, account for 60% of all deaths worldwide. Basically, they are caused by common, modifiable, preventable risk factors such as obesity, unhealthy eating patterns, low physical activity.

Obesity is a global medical and social problem with significant consequences. It is identified as one of the biggest risk factors responsible for the development of type 2 diabetes mellitus. Apart from diabetes, people with obesity are also more susceptible to suffer from endocrine diseases, cardiovascular diseases, vascular and respiratory system, and are also prone to suffer from allergies, and frequent problems of the locomotory system, and last but not least have psychological problems. Type 2 diabetes and other non-communicable diseases (heart attacks, stroke) that are associated with abdominal obesity are responsible for more deaths a year than AIDS. 80% of people with type 2 diabetes are suffering from obesity and are overweight. Along with the increased frequency of overweight cases, escalates the number and severity of arterial hypertension, diabetes mellitus, dyslipidemia conditions. The patients often experience liver steatosis, cholelithiasis, various joint injuries, varicose veins, etc. Some types of cancer, as well as dermatitis, are also associated with obesity. Prevention and prophylaxis of obesity is crucial in order to prevent the development of related diseases.

Obesity is a socially significant global problem as: there is a steady increase in its frequency; the presence of cardiovascular and cerebrovascular complications among the obese population significantly reduces their life span and quality of life; increases the occurrence of type 2 diabetes among the obese, which determines the up mentioned condition as one of the major risk factors for type 2 diabetes.

The aim and objectives of this publication are: to share some of the approaches used to prevent obesity as a risk factor for the development of diabetes mellitus and other socially significant diseases and to recommend/suggest preventive interventions in order to regulate obesity; to describe the leading causes of obesity and overweight; to offer comprehensive measures to combat obesity; to describe the approaches used in the prevention and prophylaxis of the problem.

**Keywords:** obesity, diabetes, socially significant morbidity, prevention, nutrition, motor activity

1. **Dilyana Zvezdova**, R. Nikolova, A. Veli, Antibacterial performance of chitosan based membranes loaded with tetracycline for wound healing applications, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 2019, volume 58, book 10.1., 146-151.

***Abstract:*** *In this study, the possibility of immobilizing an antibiotic (tetracycline) onto chitosan (CS) and chitosan/zeolite (CSZ) composite membranes for wound healing applications was investigated. To study the loading capacity of tetracycline onto the CS/CSZ membranes UV-spectroscopy was employed. The main challenge was to provide antibacterial properties through a local delivery of antibiotics in order to prevent infection in wounds during the wound treatment procedures. The antibacterial activity against Escherichia coli ATCC 25922 and Staphylococcus aureus ATCC 29213 strains of the developed membranes was assessed trough disk-diffusion method by means of Muеller-Hinton agar. The obtained results showed that chitosan/zeolite membranes loaded with tetracycline exhibited better antimicrobial properties compared to other studied objects.*

***Keywords:*** *Chitosan,* Chitosan/zeolite composite membranes, Zeolite, Tetracycline, *Escherichia coli, Staphylococcus aureus.*

1. **Dilyana Zvezdova,** N. Nedelchev, Кinetic studty of the non isothermal analysis of chitosan from shrimp shells from black sea, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 2019, volume 58, book 10.1.,51-56.

***Abstract:*** *In the present study, thermal decomposition kinetics of chitosan from shrimp* shells *from the Black Sea was investigated by a thermal analyzer. These studies were conducted to use chitosan for medical purposes.*

*Firstly, the experiments were performed at three different heating rates from 30°C to 800°C under air environment. A decomposition thermal analysis of crab shells chitosan from shrimp on the Black Sea was carried out. The destruction processes of a complex solid-phase were researched. The correlation dependencies for approximate solution of Arrhenius integral were applied to the study of kinetics of destruction. It was used a complex criterion to assess the quality of the decomposition. The results led us to assume that the real adequacy is achieved by decomposition of five subs. The results of were analyzed.*

***Keywords:*** *Non-isothermal kinetic study, Chitosan from shrimp* shells*, Complex processes, Complex method, Decomposition to single -model*

1. **Dilyana Zvezdova,**  Structure properties investigation of chitosan nanocomposite biofilms, Трудове на Русенския университет (2010), (Scientific works of the university (Bulgarian), 2019, volume 58, book 10.1.,103-108

***Abstract:*** *This work is intended to shed more light on the options for a creation of nanocomposite chitosan biofilms suitable as a drug loaded and delivery substance. It possesses a specific adapted stimulation matrix that delivers a drug into the patients body over a prolonged period of time. Pure chitosan and nanocomposite chitosan/zeolite biofilms are created. It is established that the chitosan nano¬composites with zeolite nanoparticles have better solubility compared to pure chitosan biofilms. Scaning elecron microfotographes (SEM) are meant to evaluate a morphology and physical film structure. X-ray microanalitical analyses are carried out on the film surface and Al, Si, Fe content distribution is established. The chitosan/zeolite nanocomposite biofilm possesses a thru physical porosity, resp. a larger specific surface area and diffusion pro¬perties are more suitable for a medical bandage, tissue engineering attributes, biiosensitive devices etc.*

***Keywords:*** *Chitosan, Chitosan/zeolite, Nanocomposite, Biofilms, Zeolite, Mechanophysical structure.*

1. **Dilyana Zvezdova,**  Opportunities for improving the quality of non-isothermal degradation kinetic analysis, *Oxidation Communications 44, No 2, 345–355* (*2021*)

The non-isothermal gravimetric analysis (TG) methods and main sources of error are

reviewed. This is mainly due to the acceptance of a constant temperature during an

experiment, the use of only an integral or differential analysis approach, the elimination

of the initial and final stages of the process, a limited number of kinetic models,

inappropriate quality criteria, etc. An algorithm and software have been developed

that take into account these and other problems. Through an experimental example

of TG analysis of chitosan the advantage of taking into account the influence of these

factors is demonstrated.

*Keywords*: non-isothermal TG analysis, chitosan, new Arrhenius correlation, complex

analysis, two-factor analysis criterion.