Chitosan-*graft* -Polyacrylamide hydrogels and its applications for controlled drug delivery

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Chitosan (CS), the linear cationic polysaccharide composed of β-(1→4)-2-amino-2-deoxy-D-glucopyranose and β-(1 → 4)-2- acetamido-2-deoxy-D-glucopyranose units, randomly distributed along the polymer chain, has attracted numerous scientists due to its outstanding biological properties like biodegradability, biocompatibility, and antibacterial activity. By the high content of amino and hydroxyl functional groups, CS has also drawn attention as a biosorbent showing high potential for the adsorption of proteins, dyes, and metal ions. To increase the drug loading capacity of hydrogels cross-linked **Chitosan-graft-Polyacrylamide hydrogels (CS-g-PAA)** were prepared by using N,N'-methylene-bis-acrylamide as cross-linker during radical polymerization of two component system. In this work, redox initiator such as CAN (ceric ammonium nitrate) was used to initiate cross-linked copolymerization.

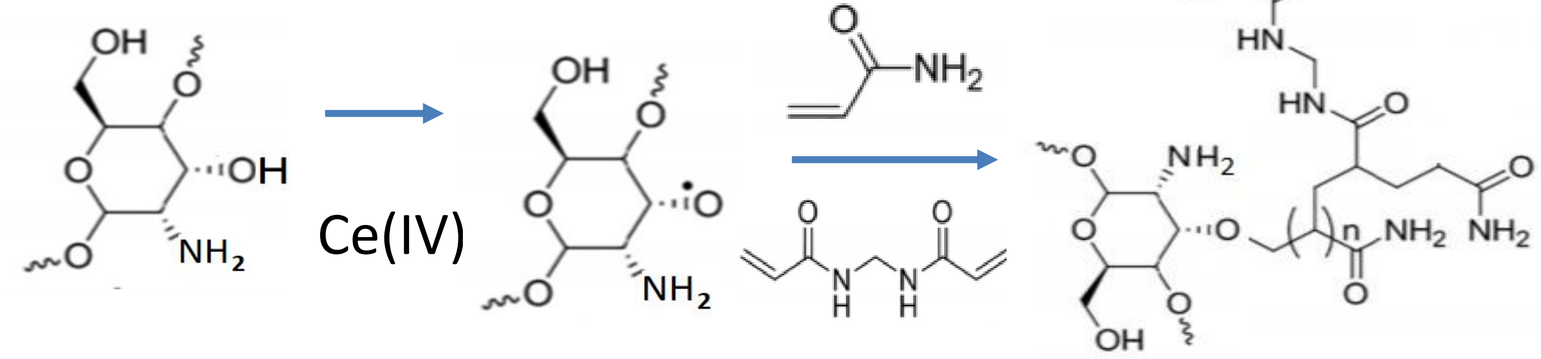


Fig.1.Schema of the synthesis of Chitosan-graft-Polyacrylamide

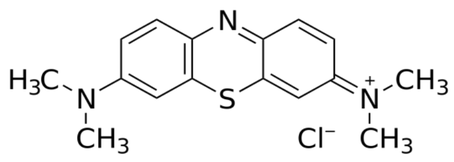
Sorption/desorption as an important factor for regulation of therapeutic concentrations of the active substances in bacteria medium

$$q_e = \frac{(C_o - C_e)V}{W}, \quad \text{mg/g}$$

$$R = (C_o - C_e)/C_o \times 100$$

Table 1-2. Amounts of absorbed compound per unit volume of hydrogel at equilibrium state after absorption q_{abs} and desorption q_{des} and desorption rate

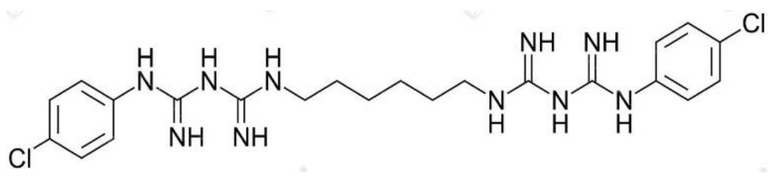
Methylene blue



Sample	q_{abs}, mg/ml in hydrogel	q_{des}, mg/ml in hydrogel	Release, %	Desorption rate, min^{-1}
1	4.672	2,137	54,2	0,4652
2	1.408	0,198	85,9	0,4142
3	0.832	0.662	20,43	0,2978
4	0.576	0.518	10,07	0,4179

$C_0 = 7*10^{-6}$ M, τ_{abs} = 24 h, τ_{des} = 150 min.

Chlorhexidine



Sample	q_{abs}, mg/ml in hydrogel	q_{des}, mg/ml in hydrogel	Release, %	Desorption rate, min^{-1}
1	3.498	1.388	60,3	0,6257
2	3.72	1.63	56,1	0,5936
3	3.124	1.714	45,1	0,5653
4	3.74	1.96	47,5	0,5089

$C_0 = 7*10^{-6}$ M, τ_{abs} = 24 h, τ_{des} = 180 min.

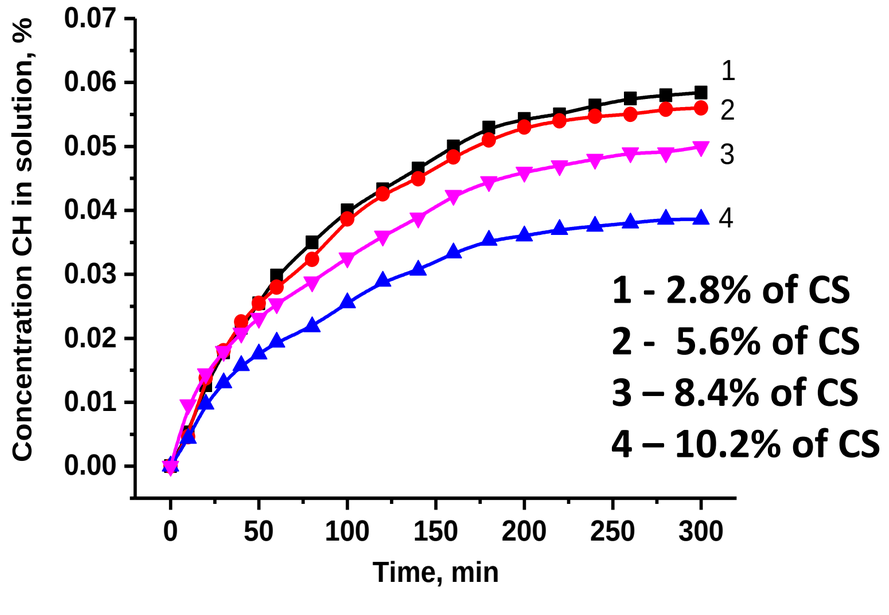
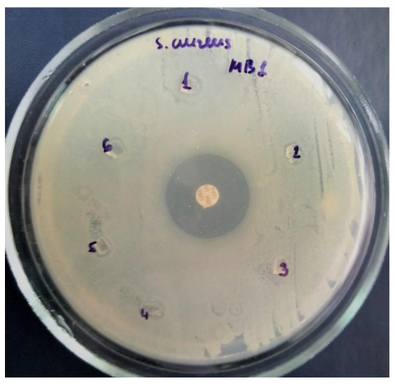


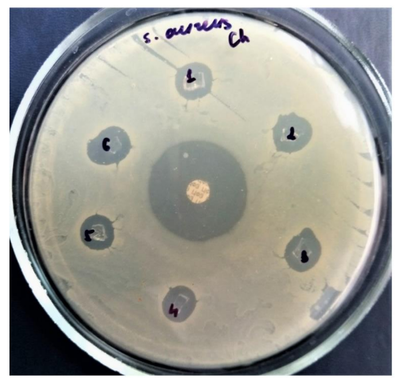
Fig. 2. Desorption of CH **out off** the hydrogel **CS-g-PAA**

Antibacterial activity of hydrogel composites loaded with CH or MB were tested in solid medium against wild strains *S. aureus*. It was shown, that **Ch-g-PAA+CH** possess higher bactericidal property then **Ch-g-PAA+MB**.

CS-g-PAA+MB



CS-g-PAA+CH



Conclusion:

Hydrogels CS-g-PAA are suitable for prolonged drug delivery