# INFLUENCE OF CHITOSAN METHACRYLATION ON MUCOADHESIVENESS OF HALLOYSITE-CHITOSAN SUSTAINED RELEASE NANOCOMPOSITES

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Halloysite is a clay mineral which can be used as a nanocontainer for prolonged release of active substances, due to its biocompatibility, tubular structure, positive lumen and negative outer surface charge. However, the use of halloysite is limited by low loading capacity and mucoadhesiveness (1). To increase pore volume and prolong residence time of a drug, halloysite was treated with acetic acid and functionalized with mucoadhesive polymers, chitosan (a cationic polysaccharide) (2) and methacrylated chitosan (degree of methacrylation 27%). The aim of this study was to evaluate the impact of chitosan methacrylation on mucoadhesiveness of halloysite-chitosan nanocomposites. Binding of both polymers at the halloysite surface was confirmed by zeta potential measurements. Halloysite and halloysite-polymer nanocomposites were mixed with an aqueous porcine mucin dispersion (0.1% m/m). After incubation with mucin during 8 h at room temperature, zeta potentials of halloysite-chitosan (HCN) and halloysite-methacrylated chitosan nanocomposites (HMCN) decreased, from +25.9 to -13.3 mV i.e. from +24.4 to -12.6 mV, respectively. The measured zeta potentials were close to zeta potential for pure mucin (-12.2 mV), indicating their interaction. Mucoadhesive properties were further investigated by measuring ability of HCN and HMCN to adsorb mucin using UV/VIS spectroscopy. HMCN were able to adsorb higher % of mucin (≈82%) compared to HCN (≈72%) and pristine halloysite (≈ 58%) after 8 h of incubation. Modification of halloysite with methacrylated chitosan has shown to be efficient in improving of mucoadhesiveness of halloysite-chitosan nanocomposites, which makes them prospective materials for drug delivery applications.

**References**

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# UTICAJ METAKRILACIJE HITOZANA NA MUKOADHEZIVNOST HALOJZIT-HITOZAN NANOKOMPOZITA KAO NOSAČA ZA PRODUŽENO OSLOBAĐANJE AKTIVNE SUPSTANCE

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Halojzit je mineral iz grupe glina koji se može koristiti kao nanonosač za produženo oslobađanje aktivne supstance, zahvaljujući svojoj biokompatibilnosti, tubularnoj strukturi, pozitivno naelektrisanoj unutrašnjoj površini i negativno naelektrisanoj spoljašnjoj površini. Međutim, primjenu halojzita ograničavaju nizak kapacitet za inkapsulaciju i mukoadhezivnost (1). Kako bi se povećala zapremina pora i produžilo vrijeme zadržavanja aktivne supstance, halojzit je tretiran sirćetnom kisjelinom i površinski funkcionalizovan mukoadhezivnim polimerima, hitozanom (katjonski polisaharid) (2) i metakrilovanim hitozanom (stepen metakrilacije 27%). Cilj ovog rada bio je da se ispita uticaj metakrilacije hitozana na mukoadhezivnost halojzit-hitozan nanokompozita. Određivanjem zeta potencijala potvrđeno je vezivanje oba polimera za površinu halojzita. Halojzit i halojzit-polimer nanokompoziti pomiješani su sa vodenom disperzijom svinjskog mucina (0,1% m/m). Nakon inkubacije sa mucinom tokom 8 h na sobnoj temperaturi, došlo je do smanjenja vrijednosti zeta potencijala halojzit-hitozan (HCN) i halojzit-metakrilovani hitozan nanokompozita (HMCN), od +25,9 do -13,3 mV tj. od +24,4 do -12,6 mV, redom. Dobijene vrijednosti zeta potencijala su bile približne zeta potencijalu čistog mucina (-12,2 mV), što ukazuje na njihovu međusobnu interakciju. Mukoadhezivne osobine su dodatno ispitane određivanjem sposobnosti HCN i HMCN da adsorbuju mucin, upotrebom UV/VIS spektroskopije. HMCN je adsorbovao veći % mucina (≈82%) u odnosu na HCN (≈72%) i polazni halojzit (≈ 58%) nakon 8 h inkubacije. Modifikacija halojzita metakrilovanim hitozanom pokazala se efikasnom metodom za poboljšanje mukoadhezivnosti halojzit-hitozan nanokompozita, što ih čini potencijalnim materijalima za isporuku aktivnih supstanci.

**Literatura**

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