11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Polysaccharide based nanoparticles formation by polyeletrolyte complexation of carboxymethylated cashew gum and chitosan

D.A. Silva(1), J.S. Maciel(1), J.P.A. Feitosa(1), H.C.B. Paula(2), R.C.M. de Paula(1)*

(1) Departamento de Química Orgânica e Inorgânica, UFC e-mail rpaula@dqoi.ufc.br
(2) Departamento de Química Analítica e Físico-Química,UFC
* Corresponding author.

Abstract – This study describes the formation of nanoparticles by complexation of two charged polysaccharides, chitosan (CH) and carboxymethylated cashew gum (CMCG). The effect of CMCG degree of substitution (DS) and solution concentration on particle size was investigated. Particle size of CH/CMCG DS = 0.16 dispersions were smaller then with DS 0.36 for all n^+/n^- ratio investigated. Particle size smaller than 200 nm were obtained when CMCG with DS = 0.16 was used in the particle formation. The polydispersity index values were small when CMCG DS 0.36 was used. Increasing the concentration of CMCG led to larger particle size.

Nanoparticles (NP) based on polyeletrolyte complexation (PEC) of chitosan (CH) with anionic polysaccharide have been investigated as a potential system for drug delivery (1-4). In the present work, the effect of increasing carboxymethylated cashew gum (CMCG) degree of substitution and solution concentration on particle size and stability of CH/CMCG nanoparticle was investigated.

PECs were prepared by methodology described by Schatz et all [3,4] by mixing CH to CMCG solution in appropriated proportion in order to obtain desired charge ratio (n^+/n^-). The CH solution was added to CMCG solution with low stirring rate and the mixture was kept resting for 24 h before particle size measurement. The particle size of PEC dispersion was monitored up to 21 days of storage time. Particle size and polydispersity index (PI) measurements of CH/CMCG NPs were carried out in a Malvern Zetasizer Nano, Model Zen 3500.

The formation of colloidal complexes between CMCG and CH was studied as function of charge ratio (n^+/n^-). Figure 1 shows the effect of CMCG DS on particle size. Particle size of CH/CMCG DS = 0.16 NP was smaller then with DS 0.36, for all n^+/n^- ratio investigated. For NP made with CMCG with DS 0.16, two behavior were observed: for n^+/n^- >1, particle size was smaller than 200 nm, while for n^+/n^- <1 values ranging from 400 to 200 nm were obtained. Nanoparticles formed with CMCG DS = 0.36 show particle size ranging from 400 to 250 nm. The polydispersity index values were small when nanoparticles were formed using CMCG with DS 0.36 (PI ranging from 0.1 to 0.3) than with DS 0.16 (PI ranging from 0.2 to 0.5). The increase of CMCG solution concentration from 1 mg/mL to 2 mg/mL resulted in larger particle size, this behavior was observed for both CMCG DSs (Figure 2). The increase of CMCG solution concentration provokes the flocculation of the particle when n^+/n^- ratio was equal to 1. The stability of the nanoparticle suspension was monitored for a period of 21 days, for n^+/n^- ranging from 2 to 20. For CH/CMCG DS 0.36 NP small variation in particle size was detected up to 21 day, the same behavior being observed for CH/CMCG DS 0.16 NP, when n^+/n^- ratio was higher than 10.

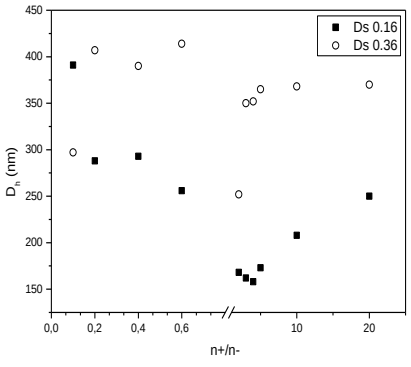

Figure 1-Efect of CMCG DS on particle size of CH/CMCG NP.

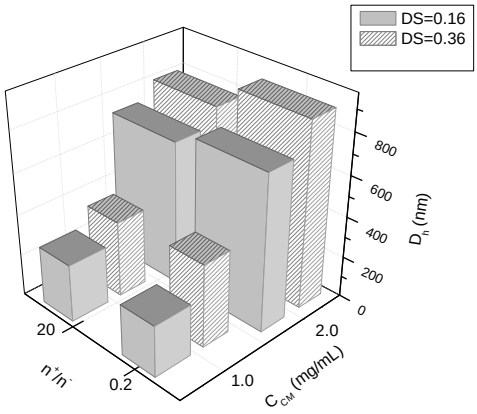

Figure 2- Efect of CMCG solution concentration on particle size of CH/CMCG NP.

References

[1] H.Dautzemberg, and N. Karibyants, Macromol. Chem. Phys. 200(1999)118.
[2] C. Schatz, A. Domard, C. Viton, C. Pichot, T. Delair, Biomacromolecules, 5(2004)1882.
[3] C. Schatz, A. Bionaz, J.M. Lucas, C. Pichot, C. Viton, A. Domart and T. Delair. Biomacromolecules, 6(2005) 1642.
[4] A. Drogoz, L. David, C. Rochas and A. Domard, T. Delair, Langmuir, 23(2007) 10950.

Rede Nanoglicobiotec/CNPq