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EFFECT OF THE CHITOSAN CHARACTERISTICS ON THE DIMENSIONS OF CHITOSAN/POLY(METHACRYLIC ACID) NANOPARTICLES

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Nanostructured materials are object of a huge amount of researches and studies due to the advantages associated to their dimensions and the potential applications in several fields. Chitosan is natural polymer with great applicability including in the form of nanoparticles, which can be obtained by simple reactions and processes. There are many *in vitro* and *in vivo* applications that prove the advantages of nanometer-sized chitosan. Researches on the controlled release of drugs are fully explored, as in studies in rabbits using the ^{99m}Technetium drug, it has been demonstrated that the chitosan nanoparticles have a considerable life time in the animal bloodstream being detected in the heart, liver, bones and spine. Thus, it indicates that the material has a better performance than the chitosan microspheres or microcapsules, since the nanoscale access to the bloodstream is facilitated and the nanoparticles can circulate throughout the body [1]. In several studies chitosan nanoparticles have also been used aiming to explore the antitumor activities. A recent study reports the use of chitosan nanoparticles against sarcoma and liver tumor by applying intravenous injections using nanoparticles of different sizes, the smaller one exhibiting higher efficiency against the tumors [2]. The antibacterial activity of the chitosan nanoparticles was tested against several microorganisms and an effective capacity of growth inhibition was observed. Thus it was concluded that the small size of the chitosan particles favors its adsorption on the cell surface, provoking the disruption of the cell membrane and preventing the cell vital processes [3,4].

In this work, chitosan/poly(methacrylic acid) nanoparticles (CHPMA) were prepared by using chitosans with different characteristics (Table 1). The nanoparticles were prepared by dissolving chitosan (0.2%) in an aqueous solution (0.5%) of methacrylic acid to which potassium persulfate was added, the system was kept in water bath at 70^{o}C until the occurrence of clouding [5].

Table 1 Identification of the nanoparticles CHPMA according to the characteristics of the chitosan samples used in their preparation.

CHPMA	Chitosan
$N10_{170}$	$\overline{DA}$=10% ; $\overline{Mv}$=170000g/mol
$N10_{90}$	$\overline{DA}$=10% ; $\overline{Mv}$=90000g/mol
$N12_{380}$	$\overline{DA}$=12% ; $\overline{Mv}$=380000g/mol
$N30_{110}$	$\overline{DA}$=30% ; $\overline{Mv}$=110000g/mol
$N10_{110}$	$\overline{DA}$=10% ; $\overline{Mv}$=110000g/mol
$N7_{115}$	$\overline{DA}$=7% ; $\overline{Mv}$=115000g/mol

According to the data presented in Table 2, varying the molecular weight of the chitosan sample has not strongly affected the dimensions of the resulting CHPMA nanoparticles. However, increasing the average degree of acetylation of chitosan caused an increase in the average particle diameter, possibly due to the higher content of acetamide groups which imposed important steric restrictions, resulting in the particles expansion.

Table 2. Average diameter (AD) of the CHPMA nanoparticles.

CHPMA	AD (nm)
$N10_{90}$	146,1±6,5
$N10_{170}$	163,0±2,1
$N12_{380}$	148,4±0,5
$N10_{110}$	130,9±3,85
$N7_{115}$	141,4±2,3
$N30_{110}$	277,4±21,8

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