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OILY-CORE COMPOSITION DETERMINES THE DEFORMATION PROPERTIES OF POLYMERIC NANOCAPSULES

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Introduction: Submicrometric particles have attracted attention as drug carriers systems.[1] The deformation properties of those carriers can influence in their tissue-penetration ability, and thus at the drug action site.[2,3] Polymeric nanocapsules consist of a polymeric wall surrounding an oily-core, which viscosity can be modified by the presence of sorbitan monostearate (SM).[4]
Objective: The aim of the present work was to determine whether the oily-core composition can affect the deformation properties of polymeric nanocapsules.
Materials and Methods: Nanocapsules suspensions were prepared by interfacial deposition of poly(ε-caprolactone). The formulations were named according the presence, LNC_0, or absence, NC_0, of SM. The particle size and polydispersity index (PDI) were measured by dynamic light scattering while the zeta potential was determined by electrophoretic mobility. The quantitative differences in the elastic behavior of nanocapsules were determined by atomic force microscopy (AFM) in *tapping* mode using *Force Volume* procedure.
Results and Discussion: Formulations had mean diameters of 213 ± 10 nm (LNC_0) and 216 ± 10 nm (NC_0) with unimodal size distributions (PDI<0.15) and the zeta potential values were negative (-10 mV). The slope values obtained by the relation of the cantilever deflection as a function of the piezo position showed the profile of the force curve obtained for the particles in comparison to the obtained for the substrate (Fig. 2.a and Fig. 2.b). It could be observed that the same force applied on NC_0 produces an indentation close to 2x higher than for LNC_0 (Fig. 2.c). The Young modulus values found were 0.537 MPa, LNC_0, and 0.364 MPa, NC_0 (Fig. 2.c) confirming that the LNC_0 particles are more rigid than the NC_0 particles.
Conclusions: The results proved that the presence of a solid lipid, SM, dispersed in the oily core of the nanocapsules quantitatively increases the rigidity of these systems. This indicates that the deformation properties of those particles can be modified according to the composition of the oily core and, thus the formulation composition must vary when the action site of the drug, that is loaded, is on superficial or deeper layers of tissues.

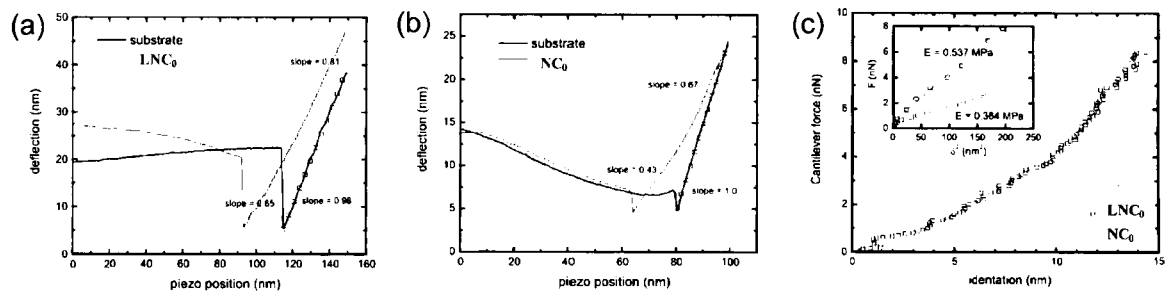

Fig. 2. Force curves. Cantilever deflection *versus* piezo position plots for (a) LNC_0 and (b) NC_0 (*Tip*: ESP7, *spring constant*= 0.20 N m^{-1}). (c) Cantilever force, obtained from the deflection data extracted from the force curves, *versus* sample indentation plot for LNC_0 and NC_0.

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