Effect of surface functionalization and loading on the mechanical properties of soft polymeric nanoparticles used as delivery systems.

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Recent studies have evidenced the importance of nanoparticle mechanics in their uptake and efficacy [1-3]. Different strategies have been developed to tune NP mechanics but is still unknown the effect of loading or functionalization on the NP mechanical properties. The main drawback to study these factors is the difficulty to find a fabrication technique that allows to modify the inner part of the NP, to functionalize the surface, to change the composition, but obtaining comparable particle structures and sizes.

In here, we performed a study of the effect of these parameters using Phase Inversion Composition method (PIC) [3] to create NPs with similar composition, structure and sizes, and determine the effect of functionalization on the NP mechanics. Samples studied were PLGA NPs, PLGA NPs containing rhodamine 6G (PLGA-Rho), PLGA functionalized with antibodies (PLGA-Ab), PLGA functionalized with dendrons (PLGA-dendron), Ethyl cellulose NPs (EC) and cationic Ethyl cellulose NPs (EC cationic).

NPs were measured individually by Atomic Force Microscopy (AFM) force spectroscopy and a multiparametric nanomechanical study was performed including the determination of the Young's modulus, breakthrough force, total indentation and adhesion, covering from small to large deformations and the NPs' rupture, thus containing all relevant mechanical information.

Results [4] showed an effect of composition, functionalization and loading on the NP mechanics evaluated and a graphical representation method has been proposed to identify formulations with similar properties.

References

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Figure

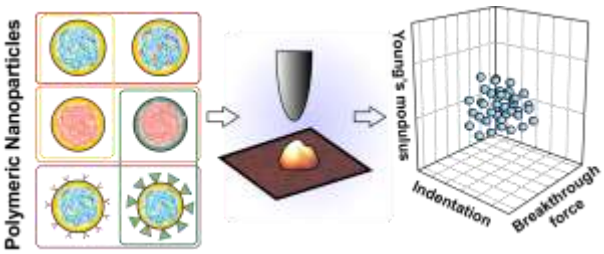

Figure 1. Graphic representation of the steps followed in this study.