VOLUMETRIC MASS ANALYSIS IN NANO-CAPSULES RELEASING PERFUME CONTENT

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Hollow nano-capsules with aromatic inner content were used in order to determine the dependency of the colloidal stability on the pH of the media and to infere the volumetric mass at different stages. The group of nano-capsules, around 100 nm in diameter and negative surface potential (in distilled water ~ pH 6.0), were analyzed using electromobility and size measurement [1,2] in different pH buffers at constant temperature, dielectric conditions and dilutions. Volumetric mass inference was calculated through image analysis of high resolution TEM images. Zeta-potential *versus* pH was deduced from the electromobility measurements, in buffer with pH ranging from 2 to 12 in even values. Zeta-potential results and a further TEM analysis did not show any release at pHs higher than 2 (fig. 1a), however, at low pH (pH 2) probable content release was found (fig. 1b).
This release was calculated by image analysis of the capsules and the probable release, using a Matlab-based software, showing a good correlation between the infered volumetric mass of the nano-capsule at pH 6 (~ 5.25 ± 0.1 nm^3) (fig. 2), and the sum of the infered volumetric mass of the nano-capsule after breaking (pH 2) (~ 4.20 ± 0.2 nm^3) and the volumetric mass of the release (~ 1.11 ± 0.1 nm^3) (fig. 3).
Even though the zeta-potential (ζ) was always negative, it diminished at low values of pH, with a predicted isoelectric point of the capsules near to pH 1.5. At higher values of pH, capsules presented a better colloidal stability, with zeta-potentials around -45mV at pH values from 6 to 12.

References:

[1] David R.E. Snoswell, Jinming Duan, Daniel Fornasiero, John Ralston, Colloid stability of synthetic titania and the influence of surface roughness, **Journal of Colloid and Interface Science** (2005) 526-535.

[2] Gleb Sukhorukov, Milan Brumen, Edwin Donath, Helmuth Möhwald, Hollow Polyelectrolyte Shells: Exclusion of polymers and Donnan Equilibrium, **J. Phys. Chem. B** (1999) 6434-6440.

Figures:

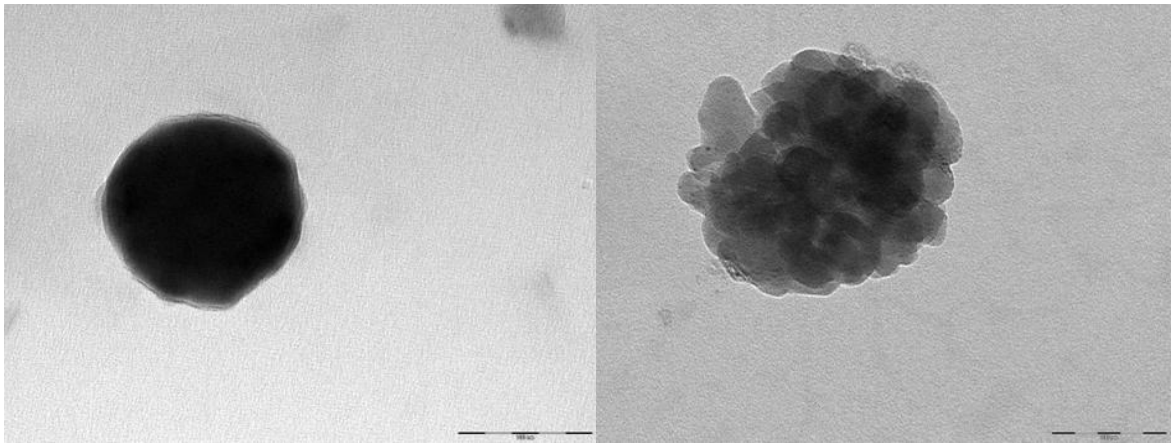

Fig. 1: Capsules a) at pH 6; b) releasing inner content at pH 2.

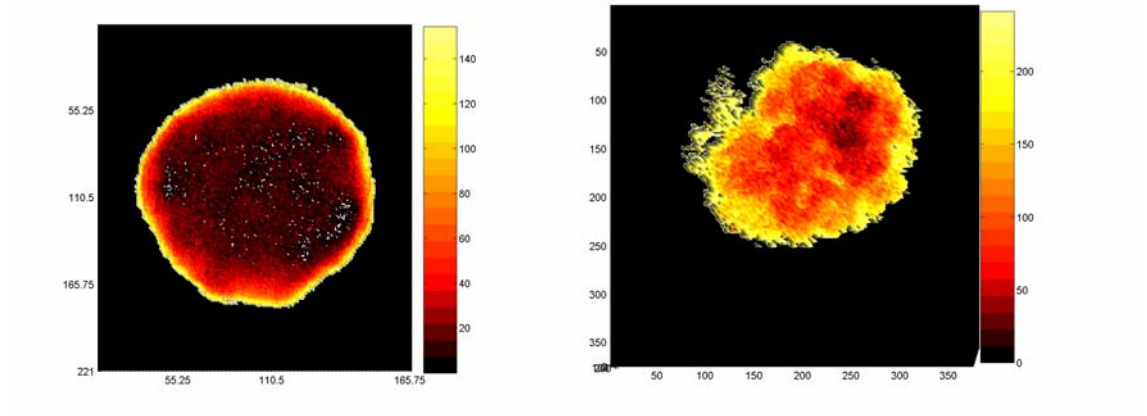

Fig. 2: Infered mass volume of a capsules a) at pH 6; b) at pH 2.

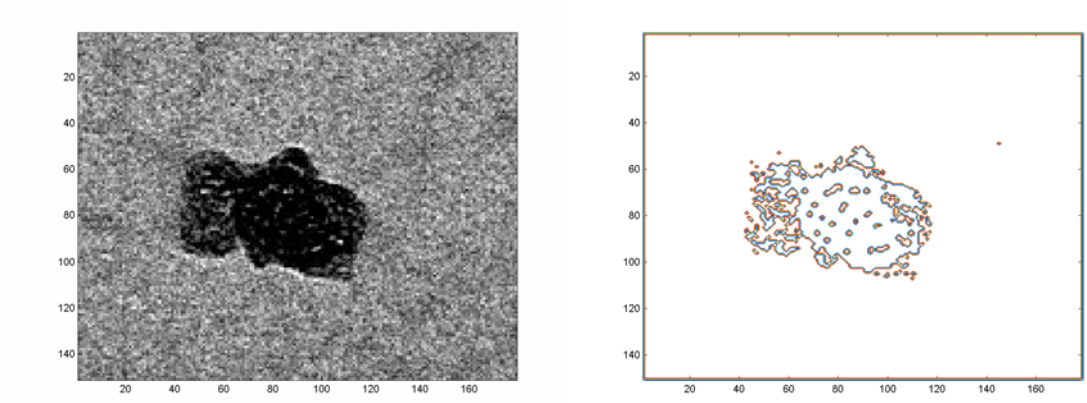

Fig. 3: a) TEM image of the release content at pH 2; b) Software recognition of the release content.