Passion fruit-like nano-architectures: enabling the clinical translation of metal nanomaterials

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Abstract

Noble metal nanoparticles (NPs) hold the promise to shift the current medical paradigms for the detection and therapy of neoplasms due to their intriguing physiochemical properties. Nonetheless, no noble metal NPs for cancer theranostics are currently available in the market. Clinical translation is mainly hampered by the issue of metal persistence in organism after the designed action, which increases the likelihood of toxicity and the interference with common medical diagnoses. Size reduction of NPs to ultrasmall regime (1-6 nm) promotes excretion by the renal pathway, yet most of their appealing properties are lost or severely altered.[1] We have proposed a smart approach to circumvent this issue by synthesizing biodegradable silica nano-architectures (NAs) of 100 nm containing 3 nm noble metal NPs embedded in a polymeric matrix: the passion fruit-like nano-architectures.[2,3] NAs mimic the optical behaviour of 30 nm NPs while affording biodegradation to kidney clearable building blocks in less than 48h. Their potential therapeutic and diagnostic applications have been demonstrated, respectively, *in vitro* towards pancreatic cancer cells, and *ex vivo* through combined US/photoacoustic imaging.[4,5] Furthermore, *in vivo* excretion assessment have been performed and the promising preliminary results will be discussed.

References

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Figures

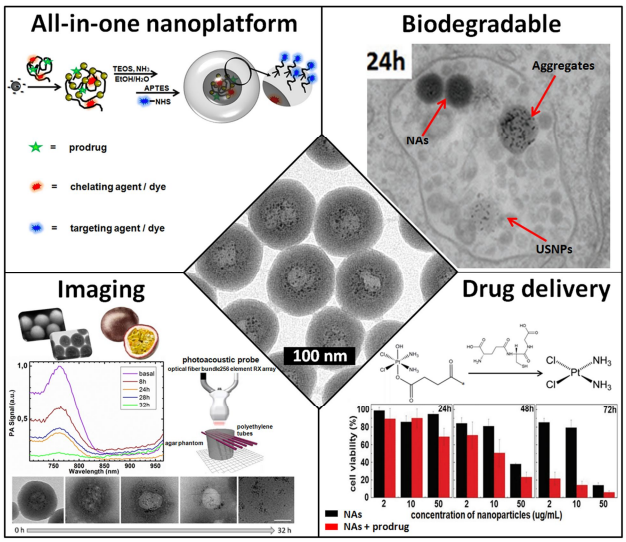

Figure 1: Typical TEM image of passion fruit like nano-architectures (NAs) (center) and their main features. Clockwise from top-left: scheme of the production for all-in-one nanoplatforms, biodegradation of NAs in cellular environment, PA imaging during degradation in phantoms, and in vitro drug delivery of endogenous GSH-triggered cisplatin prodrug.