Building enzyme nanohybrids for remote triggering

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The immobilization of enzymes by entrapment in silica matrix has been widely reported in literature [1]. This synthetic procedure leads to the production of nanostructured particles that are easy to prepare in mild and biocompatible conditions, through the formation of a silica matrix via catalysis of a polyamine molecule in presence of silicic acid. Recently, it has been demonstrated for the first time the possibility to incorporate magnetic nanoparticles into the biohybrids [2]. In this work, we reported the experimental conditions required for the co-entrapment of different MNPs with Horse Radish Peroxidase (HRP), using MNPs with different organic coatings, with the final goal to activate the entrapped enzyme thanks to the capability of the MNPs to generate heat in presence of an external alternating magnetic field (AMF).

The physical-chemical characterization confirms the versatility of this encapsulation methodology for the co-encapsulation of an enzyme with different types of MNPs. Indeed, we obtained nano-hybrids with good co-entrapment efficiencies: HRP immobilization, expressed activity and entrapped iron yields were around 90 %, 50 % and 65 % respectively. As the MNPs used in this work have different AMF-triggered heating efficiencies, these results open the path to find the most adequate one to locally reach the optimal HRP temperature (45ºC).

Thus, such versatility could expand the applicability of this type of biohybrids for the development of a new format of Prodrug Enzyme Therapy remotely controlled by magnetic heating.

References

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