Mesoporous silica nanoparticles containing polyphosphazenes for controlled delivery applications

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Abstract

The medicine carried by nanoparticles must cope with drug absorption, distribution within the body and accumulation in cancer tissues. Among different synthetic platforms, mesoporous silica-based materials have gained much attention in many potential nanotechnology areas (such as optoelectronics [1], catalysis [2], or sensing [3]). In particular, they have set a precedent in the area of nanomedicine as drug delivery systems [4]. Their thermal stability, a rigid framework which prevents premature degradation of the cargo, and their easy chemical attachment of responsive units that exhibit a control over undesirable unespecific release [5] are features that makes them stand out candidates. The external functionalization with stimuli-responsive polymeric gate-keeper units by post-grafting strategy allows a control release upon application of different stimuli. Hence, we designed different hybrid molecular gate-like nanomaterials containing sensitive organic functionalities to control the release of chemotherapeutics through a selective "close-opening gate mechanism" under pathological conditions, typical of cancer cells. Polyphosphazenes, on the other hand, are unique polymers made of a phosphorous-nitrogen backbone, well known for their degradability in an appropriate time frame into non-toxic degradation products and intermediates. Thus, we combined also both materials to create novel organosilica phosphazene-based hybrid nanoparticles [6] that could degrade under hydrolytic conditions [7] after releasing the drug.

Keywords: *silica-based mesoporous particles, controlled delivery, nanomedicine, polyphosphazenes*

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Biography

Dr. Yolanda Salinas was graduated as Chemical Engineer from University of Valencia in 2008 and under-took her PhD in 2009 at Polytechnic University of Valencia, Spain, in the research group of Prof. R. Martinez-Mañez. Since September 2015 she holds a position as University Assistant (like Assistant Professor) at the Institute of Polymer Chemistry (ICP) coordinated by Prof. O. Brüggemann, at the Johannes Kepler University of Linz, Austria.