pH-Sensitive Nanogates Based on Poly(L-Histidine) and Poly(Ethylene Oxide) for Controlled Drug Release from Mesoporous Silica Nanoparticles

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The design and synthesis of novel poly(ethylene oxide) and poly(L-histidine) grafted mesoporous silica nanoparticles (MSNs) by the grafting to method and a surface-initiated ring-opening polymerization process (ROP) is reported. Using PEG-silanes chains in order to graft poly(ethylene oxide) on the outer surface and APTES to introduce primary amino groups on the MSN outer surface that work as a ROP initiators, the nanoparticles acquired stealth properties and were decorated with a uniform pH-sensitive poly(L-histidine) (PHis) shell. The method applied for the MSN functionalization, guaranteed that there were not grafted PEO and PHis chains inside the MSNs' nanochannels. The successful grafting of the PEO and PHis chains was confirmed by FT-IR spectroscopy, TEM, SEM and TGA. Dynamic light scattering (DLS) and zeta potential analysis were used to reveal the pH-responsive nature of the polypeptide-gated mesoporous silica nanoparticles. Overall, the described materials are promising candidates as nanocarriers for potential drug delivery applications.

References:

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