SYNTHESIS OF HOLLOW PERIODIC MESOPOROUS ORGANOSILICA NANOPARTICLES (HPMO-NPs) FOR THERANOSTIC APPLICATIONS

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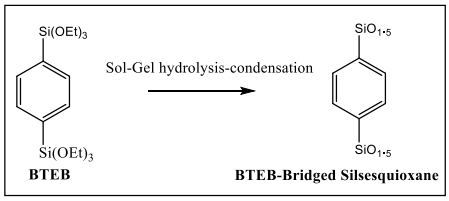
Much work has been devoted to the development of mesoporous organosilica nanoparticles (MO-Nps) for several applications (Bioimaging, drug loading/delivery, catalysis). The mesopores, obtained with a surfactant (soft template route, STR), are a key parameter as they allow high drug loading. MO-Nps are formed by grafting method and by co-condensation of organosilanes with TEOS. The hydrolysis of organo-bridged silanes gives TEOS-free hybrids called Bridged silsesquioxanes (BS) (Fig. 1, Top). Using the STR, hybrid silica called PMO (Periodic Mesoporous Organosilica) with interesting high organic content are formed and PMO-Nps with hierarchical structures can be designed[1]. Recently mesoporous hybrid silica Nps with variable structures have been reported (Core/shell and Yolk/shell, etc)[2] and PMO-Nps turned out to be a promising platform for several applications. We are interested in designing such multifunctional nanoplatforms for theranostic applications. Our work is focused on the synthesis of Hollow PMO Nps (HPMO-NPs) with a controlled core cavity and a PMO shell. To engineer these porosities, we used subsequently two templating routes: (1) silica spheresl as hard template to form the core cavity and (2) CTAB as soft template and BTEB (1,4-Bis-triethoxysilylbenzene) to achieve the mesoporous PMO shell (Fig. 1, Bottom). Na_2CO_3 and HCl are used to successively deliver the two kinds of porosity. Core silica with fixed diameters allow to control HPMO-NPs sizes and also the core cavity. An extension to multi-shell HPMO-NPs will also be presented.



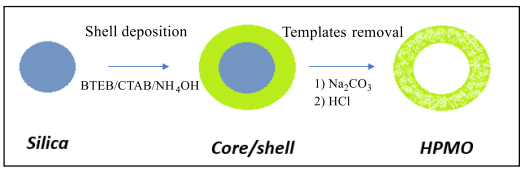


Figure 1: Synthesis of BS and HPMO-Nps

References

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