Optically and Electrically Responsive Periodic Mesoporous Organosilicas

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Periodic mesoporous organosilicas (PMOs) are a new class of organic-inorganic hybrid porous materials in which organic groups are densely and covalently embedded within the silica framework.[1,2] Recently, luminescent PMOs bearing framework chromophores such as benzene,[3] biphenyl,[3] carbazole,[4] naphthalene,[3,5] anthracene,[3,6] acridone[7] were reported. The placement of chromophores within the PMO framework appears to be advantageous in that such luminescent PMOs allow chromophores to be located in two spatially separated regions, that is, in the framework and in the mesochannels.[8] This configuration could potentially be exploited to promote the transfer of excitation energy from the framework donors to acceptors in the mesochannels. Very recently, we reported unique light-harvesting antenna properties of PMO with bridging biphenyl groups in the framework.[9] Light energy absorbed by approximately 125 biphenyl groups in the framework is funneled into a single coumarin dye molecule in the mesochannel with almost 100% quantum efficiency, indicating the great potential of PMO as a light-harvesting scaffold for light-emitting devices and photoreaction systems.

Here, we report the synthesis of color-tunable visible-light emissive PMO films with high quantum efficiency (~76%)[10,11] and the construction of light-harvesting PMO photocatalysis systems for H_2 evolution from water[12] and CO_2 reduction.[13] And, a PMO film with a hole-transporting organosilica framework is also reported.[14]

References

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