# Doped g-$C_3N_4$ based photonic crystals in catalytic systems engineering for synergetic enhancement of light-harvesting and storage

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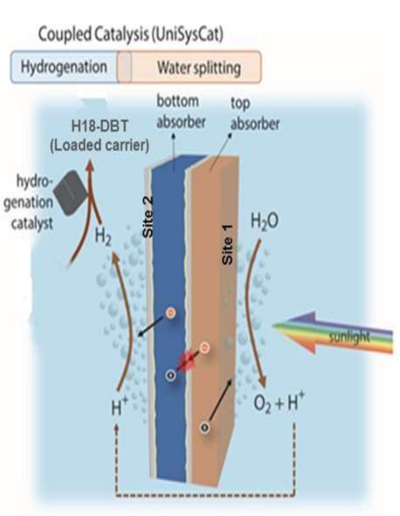
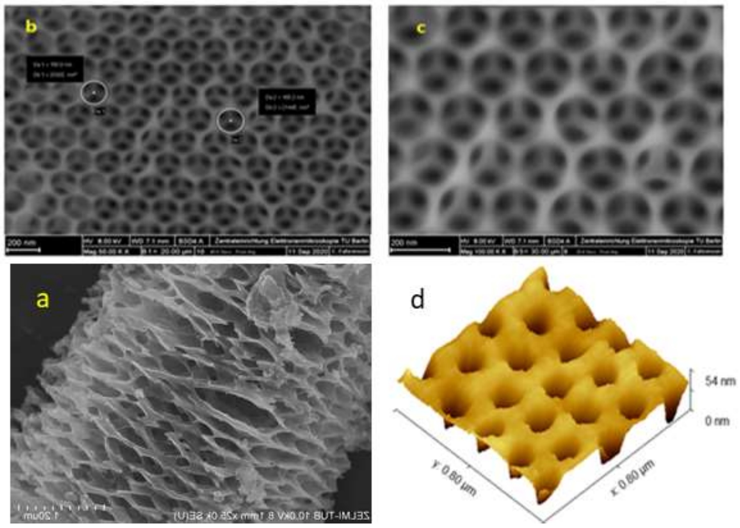
Referring to natural photosynthesis, it seems advantageous to develop artificial catalytic systems that might improve efficient light-harvesting energy which is essential to mimic the photosynthetic reactions for driving hydrogen and oxygen production[1-3], just as green plants do on the surface of their leaves. However, a major drawback of several catalyst materials is that, the absence of structural and textural defects on their surfaces and the fast recombination of photogenerated intermediate species reduce its optical properties by limiting the maximum consumption of the absorbed light energy, then limiting the use of sunlight irradiation for water splitting[2-3].




Guiding photocatalytic concept




Suspecting photonic crystals (GCN@MPA-PCs)

Thus, the main goal of this research work is to integrate graphitic carbon nitride (g-$C_3N_4$) based photonic crystals (PCs) in the designing of an artificial leaf system that might possess several favorable intrinsic optical characteristics (such as accessibility to a greater surface area), increasing lifetime species and exhibiting a strong light-trapping ability that promotes light-harvesting and direct charge transfer pathways by reducing charge recombination. The running phase of this work includes globally: (1) the synthesis and fundamental study of g-$C_3N_4$/POMs composite as a model nanostructured hybrid catalytic system along with coupled chemocatalytic reactions; (2) the designing, the synthesis, and the fundamental study of the functional artificial leaf made up of g-$C_3N_4$/POMs based photonic crystals for (3) efficient solar light harvesting and charge separation along with photocatalytic hydrogen evolution and (4) the investigation of a well suitable storing system for enhancing its large scale applications. This research project is closely linked to the research goals of UniSysCat-Berlin and attempts to provide a promising strategy for designing dual-functional materials with a high solar-to-energy conversion efficiency for various photocatalytic processes.

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