

New Cu/SteelSlags catalyst obtained by mixing copper sulphate pentahydrate (CuSO₄·5H₂O) solution and sieved steel slags powder for 2 hours, followed by separation of the solid fraction by centrifugation, washing and drying. The transformation of the active component from copper (II) to copper (0) occurred

in-situ under reaction conditions, as evidenced by the change in the colour of the catalyst from blue-grey to black.

Catalyst was tested in reactions of nitrobenzene reduction to aniline at room temperature in the presence of NaBH₄, as the reductant, and Cu/SteelSlags in deionized H₂O as the solvent during 2 hours. The recyclability test showed a consistently high yield of aniline (>90%) over 5 cycles. Cu/SteelSlags material was characterized by FT-IR, XRD, PXRF, TGA, SEM and TEM techniques before and after the catalytic cycles.

Besides to nitrobenzene reduction catalyst was tested in the reactions of various nitroarenes reduction to the corresponding anilines, where catalyst always demonstrated high activity and selectivity in short reaction time.

FIS-PO-012. Designing g-C₃N₄/g-C₃N₄ nanoarchitectures by playing with urea/melamine precursor ratio

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The metal-free polymeric graphitic carbon nitride (g-C₃N₄) is an emerging 2D layered graphene-like materials due to its exceptional properties i.e. thermal and chemical stability, non-toxicity, tunable band gap and visible light activity. For these reasons, nowadays, g-C₃N₄ finds applications in many fields like photodegradation of pollutants, photocatalysis for hydrogen production, carbon dioxide reduction, water splitting, solar light-driven photo-redox catalysis, photoelectric conversion¹. Nevertheless, it's essential to highlight some g-C₃N₄ limitations, such as the high recombination rate of the photoinduced electron-hole pairs, the poor charge carrier mobility the chemical inertness itself and the low specific surface area². For this reason, currently, considerable efforts are directed towards overcoming the aforementioned drawbacks³, either by establishing g-C₃N₄/g-C₃N₄ or g-C₃N₄/graphene metal-free homo/hetero-junctions or g-C₃N₄/inorganic semiconductors and/or metals, etc.. hybrid materials. In this study, porous g-C₃N₄ nanoarchitectures are achieved through a facile and effective in-situ synthesis method involving the thermal treatment of different melamine (M) and urea (U) precursor mass ratios. The role of the precursors on morphology and structure, was analysed by means of many characterization techniques, including HRTEM, FESEM, X-ray diffraction, UV-visible, PL and FTIR spectroscopies. Some more, samples, obtained by mixing melamine (M) and urea (U) precursors, combine the advantage of high thermal stability and significant reaction yields, due to melamine action and greatly improved surface area, low dimensionality and short migration paths, due to urea action. Consequently, different "top-down" approaches have been optimized with the aim of further increasing the surface area and decreasing the dimensionality of the U-derived-g-C₃N₄ systems, thus exploiting the well-known "quantum confinement" effect typical of low-dimensional architectures.

Lastly, preliminary results also on the synthesis and characterization of low-dimensional-g-C₃N₄/oxides heterojunctions will be discussed, in order to highlight the role of morphology, structure, surface and bulk properties on the photocatalytic performance.

References:

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ORG-PO-216. Artificial fluorescent proteins as sustainable downshifters for bio-hybrid LEDs: tailoring the emission through modifications of a non-native fluorophore

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LED lighting plays a fundamental role in the energy transition, due to its superior energy efficiency, compared to traditional light sources. For this reason, LEDs have now become the standard for indoor and outdoor applications, but their production and disposal still poses concerns in terms of sustainability, due to the need of employing rare-earth based colour down-converting filters. In the search for alternative solutions, fluorescent proteins (FPs), in which an organic fluorophore is embedded into a peptide scaffold, have been proposed as bio-based emitters for sustainable downshifter materials. An ideal FP emitter should display high fluorescence quantum yield values and good photo- and thermal stability, to ensure long lifetime, compatible with the required applications. To achieve such features, we studied several classes of fluorescent organic compounds, in order to cover the whole range of the visible light spectrum, by tailoring the absorption and emission properties. In this regard, we selected a well-known fluorescent core based on a photostable thiazole molecule as a flexible molecular platform, whose emission wavelength can be extensively modulated from green-yellow to orange-red, with relatively low synthetic effort, through conjugation with different (hetero)aryl moieties. Through synthetic modification of the fluorophore scaffold, we investigated the possibility to adapt it for efficient interaction with a properly designed protein scaffold. Finally, we revised the whole synthetic route to improve the overall sustainability of the process.

TEC-PO-008. Eco-design of cellulose nanocrystal through ESCAPE method at lab-scale

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Sustainability is becoming more and more the compass to drive the design of materials and processes. From this perspective, cellulose can be considered a sustainable natural source for the development of innovative materials due to its renewability, biodegradability, and interesting