T110: Synthesis and characterization of nanostructured materials

Absorption of H_2 and CO_2 in graphene oxide-based semiconductor systems for photocatalytic purposes

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Gas absorption is a fundamental aspect in the photocatalytic reactions of pollutant gases. Photocatalysis offers a sustainable and environmentally friendly approach to address various challenges, such as air pollution, greenhouse gas emissions, and the synthesis of valuable chemical products. This investigation synthesizes and characterize a heterostructure system based on graphene oxides (GO) to enhance its gas absorption capacity and, thus, its photocatalytic performance. This system was chosen based on previous studies confirming the use of GO in improving photocatalytic performance by using it as a support for photocatalysts [1].

The methodology adopted in this study was divided into three distinct stages: compound synthesis, characterization, and absorption studies. In the first stage, five samples with different degrees of GO oxidation (GO1-GO5) were synthesized using the Hummers method [2]. To decorate the GO, copper ferrites $CuFeO_2$ and $CuFe_2O_4$ were used, which were synthesized through hydrothermal methods for 12 hours at 180 °C using copper and iron nitrates as precursors and including the previously synthesized GO in the solution [3].

In the second stage, characterizations were performed using microscopy techniques (SEM), spectroscopy (UV-VIS and XPS), and elemental analysis (EDS). The objective was to establish the relationship between the proportions of GO and copper ferrites with their respective absorption capacities. Finally, the obtained systems will undergo absorption studies using a quartz microbalance to quantify the weight percentage absorbed by the different samples.

XPS analyses of the GO samples revealed oxidation degrees (O/C) ranging from 0.6 to 0.71. Furthermore, the absorption capacities reached maximum values of 1.30 wt% and 1.67 wt% for H_2 and CO_2, respectively. These maximum absorption values correlate with the degree of oxidation, obtaining higher values as the GO oxidation increases.

The obtained contribute to identify the absorption capacities of GO for provide a comparative reference in the current study of copper ferrite systems.

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References

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