

## PHOTOCATALYTIC DEGRADATION OF SALICYLIC ACID USING DIFFERENT COMBINATION OF COBALT SULFIDE, ZINC OXIDE AND CARBON XEROGEL COMPOSITES

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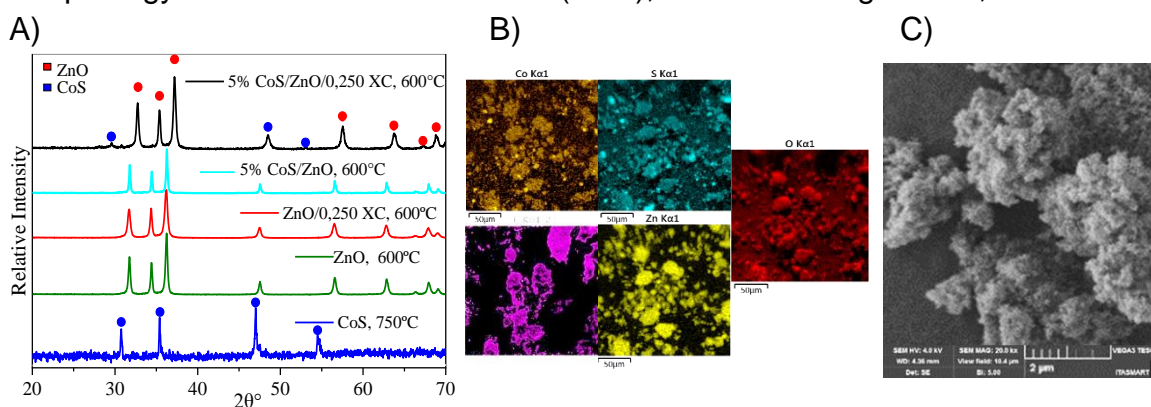
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Environmental pollution has driven extensive research into clean technologies to mitigate its effects (1). Among these, the pharmaceutical industry has faced challenges with the improper disposal of various products, leading to the necessity of effective treatment methods. Nanotechnology Engineering and Nanocatalysts has responded with advanced oxidative processes, promising in detecting and degrading micropollutants (2). Heterogeneous photocatalysis, a green technology utilizing sunlight, is particularly notable. Research has focused on developing semiconductors with lower bandgaps, higher stability, and non-toxicity (3). This study investigates the photocatalytic degradation of salicylic acid (SA), a persistent molecule used in dermatology and medicine, using composites of CoS/ZnO with carbon xerogel (XC) (4).

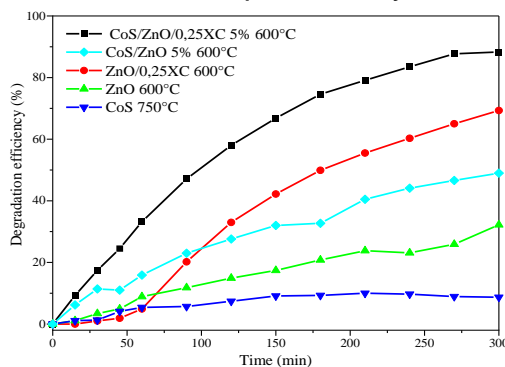
The synthesis of the materials involved the preparation of CoS and its combination with ZnO and XC. CoS was synthesized using cobalt nitrate and thioacetamide, followed by washing, drying, and calcination. ZnO and XC were combined with CoS to form the binary and ternary compound (5%), CoS/ZnO/XC, with precise control over stoichiometry and calcination processes. Characterization was conducted using X-ray diffraction (XRD) to determine crystalline phases and scanning electron microscopy (SEM) to analyze morphology and elemental distribution (EDS), as shown in figure 1 A, B and C.



**Figure 1:** Characterization, (A) X-ray diffraction (XRD), (B) elemental distribution (EDS) and (C) scanning electron microscopy (SEM).

Photocatalytic tests were performed in a controlled reactor, where 0.1 g of the photocatalyst was added to a solution of SA. The setup included a 300 W lamp simulating sunlight. SA concentration was monitored using UV-Vis spectrophotometry (5).

XRD analysis revealed the presence of characteristic peaks for CoS and ZnO in the synthesized materials, confirming the successful formation of the composite. SEM and EDS data indicated homogeneous elemental distribution, crucial for efficient charge transfer and enhanced photocatalytic activity (6).



**Figure 2:** Results of photocatalytic tests for different composites to photodegradation of SA.

Photocatalytic degradation tests demonstrated the significant influence of XC on performance. The structural stability and improved catalytic properties of CoS and ZnO composites were evident in the degradation results, highlighting the efficiency of these materials under sunlight irradiation. The combination of CoS with ZnO, supported by the presence of XC, proved effective in pollutant degradation, aligning with the findings from structural analysis (7).

This study confirms the effectiveness of CoS/ZnO/XC composites in degrading salicylic acid through photocatalysis. The incorporation of carbon xerogel notably enhances photocatalytic performance, as evidenced by XRD and SEM analyses. These findings suggest the potential for practical applications of these advanced photocatalysts in environmental pollutant degradation, offering a sustainable approach to addressing pollution challenges.

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