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Synthesis and Physicochemical Characterization of Surface-functionalized ZnO Nanoparticles

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Environmental pollution is one of the biggest issues facing society today. For the removal of harmful pollutants various methods have been proposed, among which heterogeneous photocatalysis is recognised as an effective methods for removing contaminants because it allows for the mineralization of pollutants to CO_2 and H_2O, prevents secondary pollution, and operates in mild ambient conditions. Furthermore, the method's advantages are enhanced if visible light from the solar spectrum is used in the oxidation of organic contaminants. Literature data report numerous photocatalyst from metal-oxide semiconductors category (TiO_2, ZnO, CeO_2) appreciated for their low cost and easy availability, among which ZnO nanomaterials demonstrated exceptional chemical and physical properties, including chemical and thermal stability, nontoxicity, and cost effectiveness.

The effect of synthesis parameters on the dimensions and morphology of ZnO NPs will be studied in this work, together with their methodical characterization for the assessment of their structural, morphological and optical characteristics. Zinc oxide nanoparticles were synthesized via chemical precipitation method by employing different reaction precursors and experimental conditions, in order to conveniently tune the band gap energy values of the prepared samples. Further, the as-prepared nanoparticles will be surface modified with silane derivatives for subsequent integration in polymeric supports, with the goal of avoiding nanoparticles agglomeration, translating photocatalytic activity towards visible light, and facilitating catalyst reusability/recovery after photocatalytic cycles.

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