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Synthesis and characterization of TiO₂/C/Ag nanocomposite films for photocatalytic applications

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Resumo:

The research focused on exploring the nanostructural features, morphological traits, and photocatalytic performance of titanium dioxide-carbon (TiO₂-C) composite coatings embedded in silver. The TiO₂-C coatings were produced via the sol-gel method, applied onto a glass substrate using an airbrush, and then heat treated in a muffle furnace at 500°C for 30 minutes. Silver integration was accomplished by submerging the coatings in a solution containing silver nitrate and ethyl alcohol (0.01 M) post-annealing, followed by a 2-hour exposure to ultraviolet light. The efficacy of the coatings in photocatalysis under visible light irradiation was assessed by monitoring the degradation of methyl orange dye over a 6-hour experimentation period. The analysis of the coatings involved X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), Raman spectroscopy, and scanning electron microscopy (SEM). The findings revealed a homogeneous dispersion of the metal across the expanded graphite surface, with TiO₂ existing in both anatase and rutile phases, and silver in its metallic state. The TiO₂-C heterojunction formed displayed characteristic behavior related to type II heterojunctions, known to amplify the photocatalytic efficiency of the material under visible light.

