Synthesis, Integration with Textiles, and Application in Sensors of $SrMoO_4$:Ag

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INTRODUCTION

The synthesis of strontium molybdate ($SrMoO_4$) has attracted interest due to its notable properties for several scientific and potential technological applications, including its use in sensors and detectors.[1] The sensor applications encompass a wide range of areas including medical diagnostics, environmental and agriculture monitoring, and even precise tracking of athletic performance.[2] Studies have demonstrated that doped materials with noble metals can enhance sensor performance.[3] Additionally, silver doping imparts antimicrobial properties offering further additional functional benefits. This work investigates the structural, morphological, optical, and photocatalytic properties of pure and silver-doped strontium molybdate ($Sr_{1-x}Ag_xMoO_4$ (x= 0, or 0.07), and evaluates its potential for water and lactate detection, as well as integration into textiles.

EXPERIMENTAL STUDY

The $Sr_{1-x}Ag_xMoO_4$ were synthesized by co-precipitation method, followed by microwave hydrothermal processing and the incorporation of surfactant molecules. The microstructural and optical characterizations were performed using X-ray diffraction (XRD), Raman, Fourier transformed infrared (FTIR), ultraviolet–visible (UV-Vis) spectroscopy, and scanning electron microscope (SEM). The photocatalytic activity was assessed by monitoring the degradation of methylene blue (MB) under illumination from a commercial LED lamp in an optically isolated system. The sensor performance of the designed samples was evaluated by measuring the changes in capacitance during exposure to water and lactate vapor. The textile samples impregnated with $Sr_{1-x}Ag_xMoO_4$ were analyzed by SEM, FTIR, and UV-Vis spectroscopy.

RESULTS AND DISCUSSION

The studies revealed that all the prepared samples have a tetragonal scheelite-type crystal structure. The $Sr_{0.93}Ag_{0.07}MoO_4$ sample - without microwave or surfactant treatments - exhibited superior photocatalytic performance, achieving the highest degradation rate of methylene blue. The FTIR analysis confirmed the successful incorporation of the $Sr_{1-x}Ag_xMoO_4$ into the textile matrix. The SEM images revealed a uniform and homogeneous coating of the textile surface, suggesting effective impregnation. Additionally, UV–Vis spectroscopy demonstrated that the treated textiles exhibited enhanced absorption in the ultraviolet region, indicating potential for UV-blocking applications. Results showed that a surfactant molecule enhanced sensor performance, while hydrothermal treatment did not significantly improve their efficiency.

CONCLUSION

The syntheses were efficient, yielding the desired materials. Both $SrMoO_4$ and $Sr_{0.93}Ag_{0.07}MoO_4$ samples exhibited promising results in detecting water and lactate solutions, as well as in textile integration

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