

## Preparation, Physical and Photoelectrochemical Characterization of Ag/CuCo<sub>2</sub>O<sub>4</sub>: Application to Solar Light Oxidation of Methyl Orange

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**Abstract :** The compounds with a spinel structure have received special attention because of their numerous applications in electronics, magnetism, catalysis, electrocatalysis, photocatalysis, etc. Among these oxides, CuCo<sub>2</sub>O<sub>4</sub> was selected because of its optimal band gap, very close to the ideal value for solar devices, its low cost, and a potential candidate in the field of energy storage. Herein, we reported the junction Ag/CuCo<sub>2</sub>O<sub>4</sub> (5/95 % wt.) prepared by co-precipitation, characterized physically and photo electrochemically. Moreover, its performance was evaluated for the oxidation of methyl orange (MO) under solar light. The X-ray diffraction exhibited narrow peaks ascribed to the spinel CuCo<sub>2</sub>O<sub>4</sub> and Ag. The SEM analysis displayed grains with regular shapes. The band gap of CuCo<sub>2</sub>O<sub>4</sub> (1.38 eV) was deduced from the diffuse reflectance, and this value decreased down to 1.15 eV due to the synergy effect in the junction. The current-potential (J-E) curve plotted in Na<sub>2</sub>SO<sub>4</sub> electrolyte showed a medium hysteresis, characteristic of good chemical stability. The capacitance-2 - potential (C<sup>-2</sup> - E) graph displayed that the spinel behaves as a p-type semiconductor, a property supported by chrono-amperometry. The conduction band, located at 4.05 eV (-0.94 VNHE), was made up of Co<sup>3+</sup>: 3d orbital. The result showed a total discoloration of MO after 2 h of illumination under solar light.

**Keywords :** junction Ag/CuCo<sub>2</sub>O<sub>4</sub>, semiconductor, environment, sunlight, characterization, depollution

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