

ABSTRACT

Methylene blue (MB) possesses a chemical formula of $C_{16}H_{18}N_3S$ and falls under the class of aromatic heterocyclic compounds, and it is toxic when ingested or inhaled and has a tendency to cause skin as well as eye irritation. Photocatalysis as a method for wastewater treatment is one of the most cost effective and efficient among all the existing wastewater treatment techniques. Cadmium Oxide (CdO) has a bandgap of 2.2 – 2.5 eV and is a semiconductor, which summarises its ability when used with photocatalysis. It is also used as an aid in the formation of CdO through the extraction of green tea leaf extract from *Camellia sinensis*. In this study, CdO was synthesized while using green tea leaf and different durations of heat treatment for methylene blue degradation. This included preparation of tea leaf extract for green synthesis of CdO with varying synthesis heating times, testing of effectiveness of the synthesized photocatalyst, kinetics study on the photocatalytic degradation of methylene blue using CdO, and characterization of synthesis CdO using techniques such as FTIR, XRD, SEM-EDX, UV-DRS, and TGA. This research successfully created CdO using a green synthesis method. XRD and FTIR results indicate that CdO was successfully synthesized. The surface morphology of CdO-4 and CdO-7 showed differences in form, with CdO-7 having less uniform element distribution due to agglomeration. Bandgap analysis results showed that the bandgap of CdO-7 was larger than that of CdO-4 due to the longer heating time. TGA analysis results indicated that water, organic compounds, and CdO decomposed. Photocatalytic results showed that CdO-4 produced the highest methylene blue degradation percentage compared to other CdO samples.

Keywords: Cadmium oxide, green synthesis, green tea, photocatalysis, methylene blue.