

SUMMARY

This research aims to convert low-economic-value agricultural biomass waste, such as coconut shells, into high-economic-value materials. The study focuses on fabricating electrodes and transforming coconut shell charcoal (CSC) into activated coconut shell carbon (CSAC) through processes. This includes catalytic graphitization using $FeCl_3$ as a precursor, followed by high-temperature heating at $900^\circ C$ for 1 hour in a non-atmospheric furnace with a nitrogen gas flow, resulting in a graphite-like microstructure (CSGAC). Finally, the CSGAC/PANI composite's developed functionality is tested in the degradation of tartrazine dye molecules using an electrochemical advanced oxidation process (EAOP) cell. The molecular development of the CSGAC/PANI composite is aimed at enhancing conductivity through the conductive polymer PANI. The optimal development of the CSGAC/PANI composite material is achieved using the in-situ polymerization method. XRD diffractograms, FTIR spectra, SEM-BET morphology-surface area, and electrical conductivity data of CSGAC/PANI-2 confirm the successful formation of the composite with an overlapping structure through π - π interactions between the graphite microstructure and the conjugated benzene rings of the PANI polymer chain. The fabricated CSGAC/PANI electrode effectively degrades tartrazine pollutants by up to 96% in an electrochemical advanced oxidation process (EAOP) cell within 60 minutes of electrolysis.