Abstract:

This thesis explores the preparation of multifunctional CaO-rich eggshell biochar and graphene oxide doped biochar composites, highlighting their exceptional performance in enhancing latent fingerprint development as well as their diverse environmental applications. Indicative of their surface charge properties, the characterization results disclose zeta potentials of -19 mV for biochar and -37 mV for biochar containing GO. The particle size analysis reveals respective average diameters of 95 nm and 96 nm, confirming that both materials are suitable for a variety of applications. The doped biochar-GO product has a remarkable capacity for chromium adsorption, with an 80.08 percent removal rate. Additionally, the photocatalytic properties of biochar are used to degrade Congo red (77.72%) and methylene blue (84%) to demonstrate its efficacy in organic dye removal. Notably, CaO-rich biochar and GO-doped biochar are both promising agents for the enhancement of latent fingerprints, casting light on their potential in forensic science. This study demonstrates the adaptability and effectiveness of these materials in addressing environmental and forensic issues.