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USABILITY OF FE/CO CO-DOPED CARBONIZED FIBER BASED YARN WASTE IN THE ADVANCED TREATMENT OF BIOTREATED TEXTILE WASTEWATER: ADSORPTION, FENTON-LIKE OXIDATION PERSULFATE OXIDATION PROCESSES

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Abstract

In this study, fiber-based yarn wastes produced in yarn manufacturing and dyeing industry were used, and Fe/Co co-doped carbonized fiber-based yarn waste (Fe/Co-CFY) was synthesized by a green synthesis method using mint extract. This research investigated the treatment of biologically treated textile wastewater from the same industry using the synthesized Fe/Co-CFY through adsorption, Fenton-like, and persulfate oxidation processes, according to the parameters affecting the processes. The adsorption performance of Fe/Co-CFY was assessed under varying pH and dosage conditions, achieving maximum COD, TOC, color and ABS-254 nm removals of 68.1%, 46.4%, 93.2%, and 85.3%, respectively, at pH 3 and 10 g/L adsorbent. The adsorption data were best described by the Freundlich isotherm and pseudo-second-order kinetic models. Additionally, Fenton-like and UV/Fenton-like oxidation processes significantly enhanced removal efficiencies, reaching COD and TOC removals up to 88.8% and 90.8%, respectively. In persulfate oxidation, 82.0% COD, 68.6% TOC and 86.2% color removal were observed. Among the tested methods, UV/Fenton-like oxidation demonstrated the highest overall performance. While no significant Fe leaching was observed, Co release was notable, with the lowest Co concentration detected in the UV/Fenton-like oxidation process. As a result, this study showed that the fiber-based yarn waste generated in the yarn production facility can be converted into Fe/Co co-doped carbonized fiber-based yarn waste, which can be used as an promising low-cost adsorbent or catalyst in the wastewater treatment in the same industry with advanced treatment processes, and higher organic matter and color removal can be achieved. At the same time, it was observed that the fiber-based yarn waste generated in the yarn production facility can be effectively evaluated and waste reuse and waste reduction can be achieved.

Key words: COD, color, textile waste

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