VALORIZATION OF BURNT IQOS CIGARETTE WASTE INTO HIGH SURFACE AREA BIOCHAR FOR WATER PURIFICATION APPLICATIONS

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Abstract

This study investigates the valorization of burnt IQOS cigarette waste into biochar and its subsequent activation to enhance structural porosity and surface area for environmental applications. Initiated by pyrolyzing the residual waste at high temperatures, the process yields a carbon-rich biochar, which is then subjected to a chemical activation phase. This phase employs potassium hydroxide (KOH) and steam to introduce a complex porous structure comprised predominantly of micro and mesopores, effectively enlarging the material's surface area. Characterization techniques such as Scanning Electron Microscopy (SEM) and Brunauer-Emmett-Teller (BET) analysis were utilized to ascertain the morphological and surface properties of the activated carbon. The SEM images revealed a highly porous texture, while BET analysis confirmed a substantial increase in surface area, critical for adsorption processes. Further, the activated carbons potential for water purification was evaluated through adsorption tests targeting common aquatic contaminants, including heavy metals and organic compounds. The results demonstrated notable efficiency in removing these pollutants, underlining the active carbon capability as a robust adsorbent. This efficacy is attributed to the increased surface area and the presence of functional groups on the active carbon surface, which interact with the contaminants. Moreover, this research underscores the dual benefit of converting IQOS cigarette waste into a functional material for pollution control, aligning with sustainable waste management and environmental remediation strategies. It not only addresses the disposal issue of cigarette waste but also contributes to the broader context of circular economy practices. The findings encourage further exploration into the applicability of waste-derived active carbon in diverse environmental settings, potentially reducing reliance on conventional adsorbents and fostering innovation in waste recycling technologies.

This pioneering study highlights the innovative use of waste material to address environmental challenges, presenting a scalable opportunity for industrial applications. The implications of such technologies are vast, providing a blueprint for future efforts in environmental management and sustainability.

Keywords: *IQOS Cigarettes, Biochar, Water Purification, Surface Area, Active carbon.*