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Processing Of Liquid Waste From Dyeing Woven Yarns Using Activated Charcoal

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Abstract

Textile liquid waste containing various chemicals and pollutants is a serious problem because it is difficult to achieve waste water quality standards in accordance with Minister of Health Regulation No. 416/1990. This research uses a literature review method to analyze various studies related to the use of activated charcoal in treating industrial liquid waste. Activated charcoal, with a carbon composition of 85-95%, is known to have high adsorption capabilities thanks to its porosity which can reach hundreds to thousands of square meters per gram. The process of making activated charcoal involves carbonization and activation of carbon materials at high temperatures. The method used was a review of articles between 2015 and 2023. The research results showed that activated charcoal was effective in reducing Chemical Oxygen Demand (COD) by up to 98.74%, which indicates a significant reduction in pollutant content. The adsorption process, which is an exothermic reaction, occurs more efficiently at low temperatures and increases with the length of contact time between activated charcoal and liquid waste. Conclusion: Textile industry liquid waste and variations in activated charcoal dosage and shaking time provide concrete data on the efficiency of activated charcoal in dealing with water pollution, offering a sustainable solution for industrial liquid waste management.

Keywords: *pollutans, charcoal, COD*

1. Background

In the textile industry, the production process often produces liquid waste containing a mixture of residual chemical additives, substances that emit fibers, and other substances that are released both chemically and mechanically. This waste tends to be dumped into nearby water bodies or on land by many producers, contributing around 10% to 15% of total liquid waste (Christiany, 2019) . The quality of waste water produced by the waste water management system does not meet clean water quality standards in accordance with Minister of Health Regulation No. 416/1990, making it unfit for the recycling process. The high cost of one recycling also adds to the problem. One solution that is often implemented is using an activated carbon adsorption system, which is considered more economically efficient (Gani & Widodo,

2011) . Activated carbon, which is made from carbon materials heated at high temperatures and has a carbon content of around 85-95%, is able to absorb various substances in liquids or gases thanks to its wide pore structure, which if you calculate the entire surface area of the pores in one gram of carbon active can reach up to thousands of square meters. The process of making activated carbon involves carbonization and activation of carbon materials at higher temperatures (Irmanto & Suyata, 2010) .

2. Methodology

The research was carried out through a literature review, including a review of various national and international scientific publications published between 2015 and 2023. Only literature that was relevant to the problem discussed was selected for further review. In-depth analysis was conducted on these sources before grouping them based on related themes. Based on this analysis, a comprehensive and structured review article was prepared, prioritizing important aspects raised in the literature.

3. Results and Discussion

The use of activated carbon in the adsorption process offers significant advantages, including reducing Chemical Oxygen Demand (COD) levels by up to 98.74%, which shows its effectiveness in reducing water pollution. The adsorption process, which is an exothermic reaction and whose effectiveness increases with decreasing temperature, allows solute molecules to remain longer on the surface of a solid due to the imbalance of forces (Pambayun et al., 2013) . Adsorption efficiency depends on the nature of the carbon and solute, with molecular structure and solubility playing an important role.

Activated carbon is made from materials such as coal, which is carbonized at a temperature of 600°C and then activated (Ningsih et al., 2016) . The use of various masses of activated carbon showed increased COD absorption, with optimal results achieved with a given mass. Another study found that the use of chemical activators increased the adsorption ability of activated carbon on phenols in wastewater. In a different study, oil palm fronds and corn cobs were processed into activated carbon, showing a significant reduction in COD levels after the adsorption process (Khairunnisa et al., 2017) .

Tests on liquid waste from the textile industry, solutions mixed with 100 mesh activated charcoal at various shaking durations showed a decrease in COD levels. This indicates the effectiveness of active carbon in purifying textile industry wastewater (Sartika & Supardan, 2019) .

4. Conclusion

Textile industry liquid waste and variations in activated charcoal dosage and shaking time provide concrete data on the efficiency of activated charcoal in dealing with water pollution, offering a sustainable solution for industrial liquid waste management.

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