

Conference Paper

Reduction of Chrom Ion (Cr) With Ion Exchange Resin in Liquid Waste of Leather Tanning

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ABSTRACT

The leather tanning industry was classified as industrial in large quantities and dangerous. One of the wastes that produced was waste liquid containing chromium ions. The liquid waste that was released was very cloudy, colored, and has rotten management that caused serious problems to water bodies, communities and the environment. The waste without special handling was discharged into the environment. So that with the ion exchange method, it could reduce environmental pollution caused by industrial leather tanning waste. This study aimed to determine the effect of resin in reducing the chromium ion content in the liquid waste of the leather tanning industry using the ion exchange method. Namely, by consolidating waste and resin with various predetermined variables. The positively charged chromium ion will exchange with the H⁺ ion found in dowex resin. So that the chromium levels in the tannery liquid waste could be reduced. The results were obtained by the contact time and weight of the resin used. The highest reduction in chromium ion content was at contact time for 80 minutes with a resin weight of 150 grams of 98.75%.

Keywords: Chrome, waste liquid, resin, ion exchange

Introduction

One type of industry that uses hazardous and toxic materials (B3) in its production process is the leather tanning industry that uses chromium compounds. (Asmadi *et al.*, 2009). The chromium compounds in the tannery industrial wastewater come from the tannery production process, wherein tanning leather that uses chromium sulfate compounds, not all of them can be absorbed by the skin in the tanning process so that the rest is released in liquid form as liquid waste. (Sahlan *et al.*, 2016). Heavy metals are generally toxic to living things, although some of them are needed in small amounts (Bugis *et al.*, 2017). Ion exchange can be used in wastewater treatment processes. The advantage of this method is its ability to capture heavy metals with high efficiency. (Pujiastuti, 2008). The ion exchange process consists of a chemical reaction between ions (cations or anions) in the liquid phase and ions from the solid phase. Solids that have ions to exchange for liquid phase ions are often known as ion exchange resins. Certain ions from the solution are more easily absorbed (chemical reaction occurs) by the ion exchange solid and an equivalent number of ions will be released by the solid back into the solution phase. (Sani *et al.*, 2019). The adsorption method is conventional but the most effective way to reduce chromium metal ions. Chrome metal ion adsorption can use inorganic flocculants, including active alumina, silica gel, ferrous sulfate, and aluminum sulfate (Sugihartono, 2016). The resin has the stability that can be used for a long time, is not easily damaged in regeneration (Apriani & Wesen., 2011). In this study, using the ion exchange method using resins in the tannery industrial liquid waste which is expected to reduce the chromium ion levels in the liquid waste. This research aimed to determine the effect of dowex resin in reducing the chromium ion content in the tannery industry wastewater.

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Research Method

The main material used is liquid waste originating from the Magetan Leather Industry - East Java. While the auxiliary materials used include dowex and aquadest resins purchased from the Chemical store located in Sidoarjo. The instrument used was a series of ion exchange devices consisting of a magnetic stirrer and beaker glass.

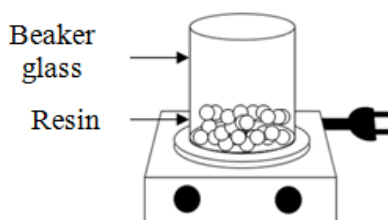


Figure 1. Ion Exchanger

The method for analyzing chromium ion content is AAS (atomic absorption spectrophotometry). The weight of dowex resin used in ion exchange is (50, 75, 100, 125, 150) grams, 300 ml of tannery liquid waste was put into the ion exchange device and the contact time was (60, 65, 70, 75, 80) minutes. Filter the mixture of liquid waste and dowex resin to obtain sediment and filtrate. The obtained filtrate was analyzed for its chromium (Cr) content on each variable being run.

Result and Discussion

All analysis results in the process of decreasing the chromium ion content in the tannery liquid waste were carried out at the Nutrition Laboratory of the Faculty of Public Health, Airlangga University, Surabaya using the AAS (atomic absorption spectrophotometry) method.

Table 1. Results of the initial analysis of chromium ion content in wastewater

Test Parameters	Results
Chromium	3.670 mg/L

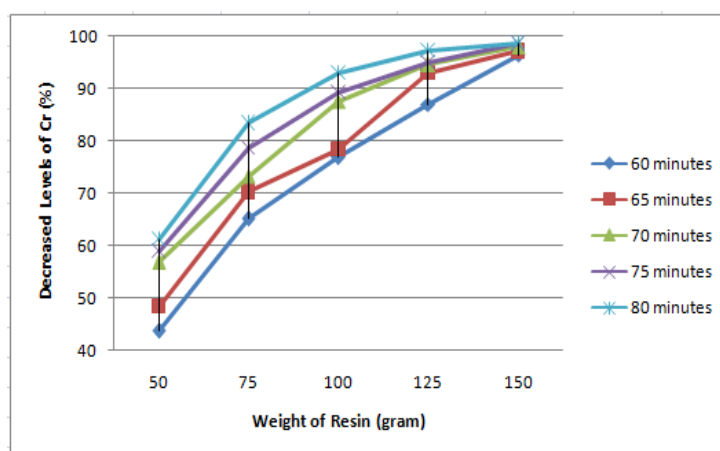


Figure 2. The relation between resin weight and decreased Cr content

Figure 2 shows that the more resin used, the higher the % reduction in chromium (Cr) content obtained. Based on the research data, it was found that the highest reduction in chromium (Cr) content was 98.75%

at 150 grams of resin weight. This is because the more resin used, the more chromium (Cr) ions are absorbed. The sample in the form of tannery liquid waste contains chromium ions that are positively charged. When contacted with dowex resin which includes cation resin (there is an H^+ group), the chromium ions will exchange with the H^+ ions found in dowex resin. So that after the contact between the resin and the liquid waste sample, the chromium ion is bound to the resin and the chromium ion content contained in the tannery liquid waste has decreased.

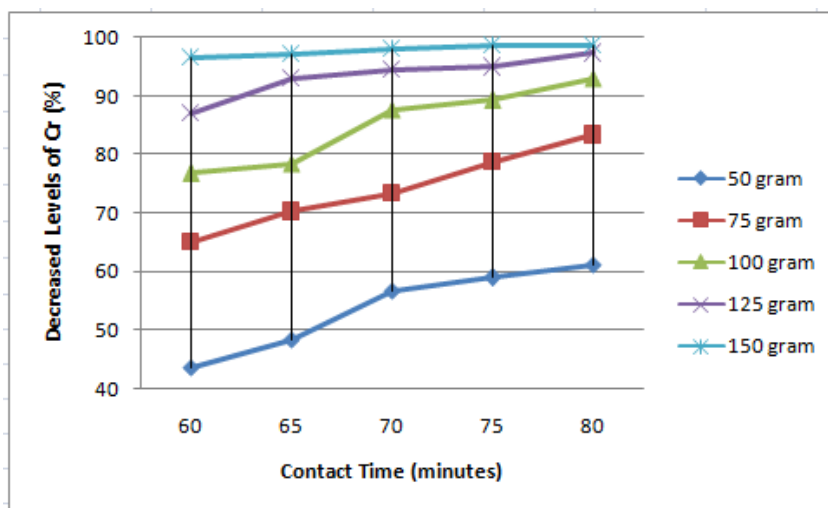


Figure 3. The relation between contact time and decreased Cr content

Figure 3 shows that the effect of contact time on the decrease in chromium ion content is shown to be directly proportional. The best results were with a contact time of 80 minutes where there was a decrease in the chromium (Cr) ion content of 98.75%. The chromium (Cr) ion-exchanged in the resin undergoes an irreversible reaction so that the resin has not been saturated for 80 minutes.

Conclusion

The content of chromium (Cr) ions in tannery wastewater can be reduced by using dowex resin (cation resin). The largest reduction in chromium (Cr) ion content was at 150 grams of resin weight with a contact time of 80 minutes, which was 98.75%. From the results of the final analysis, the ion content of chromium (Cr) was obtained 0.456 mg / L - 0.046 mg / L, which indicates that these levels have met the quality standards of the tannery industrial wastewater that is allowed to be discharged into the environment, which is 0.6 mg / L. The ion exchange method using resins is quite effective for treating liquid waste before being discharged into the environment because it is easy to apply and also resins that can be regenerated for long-term use.

Acknowledgment

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