Removal of Acetic Acid from Wastewater by Low Cost Materials- a Review

Mrunmai Joshi, Nikita More, Deepa Gaikwad, Sunil Kulkarni

***Abstract*—Low cost treatment of the wastewater is the need of an hour. Various types of industries emit different types of wastewater. This calls for the treatment targeted at the major pollutants in the wastewater. Acetic acid is present in the effluent from petroleum, fine chemical, pharmaceutical and textile industry. In this review, the research carried out to remove acetic acid and the results are summarized with respect to the methods used and the effectiveness of the method.**

***Index Terms*—removal, adsorption, concentration, isotherms**

I. INTRODUCTION

Acetic acid is one of the major pollutants in petroleum, fine chemicals, textiles and Pharmaceutical industry. Various methods used to remove acetic acid include adsorption, ion exchange, evaporation, precipitation and membrane techniques. Adsorption by using various adsorbents is also attractive alternative. Use of low cost adsorbents is very important attribute because of which the research in this field has gained an importance.

II. REVIEW ON ACETIC ACID REMOVAL BY VARIOUS METHODS

Li et.al.have carried out research on adsorption of acetic acid on alloy surface (Au/Pd)[1]. They studied the adsorption of acetic acid on gold surface .The adsorption of acetic acid was carried out at temperature of 80 K.After heating it to 207 K ,acetate species are formed on the surface. Formation of acetate species decreases the gold concentration. While adsorption of acetic acid took place,there was decomposition of CO_2, Hydrogen and water over the same temperature range. They concluded that mole fraction of gold should be greater than 0.5.Sawsan et.al have carried out a research on high strength acidic industrial chemical waste water using expanded bed absorber [2]. They observed that the adsorption behaviour of acetic acid on activated carbon was a function of concentration of the adsorbate, contact time and adsorbent dosage. They used Freundlich and Langmuir adsorption isotherms. Also studies on effects of various parameters such as flow rate, Bed height, and inlet adsorbate concentration were carried out. Dina et.al have carried out research on adsorption of acetic acid onto activated carbon obtained from maize cobs. For activation, chemical activation with zinc chloride was employed[3]. They passed acetic acid solution over five beds of activated carbon prepared from maize cobs. They varied the concentration of acetic acid between 0.007 and 0.3948 mol/l. From the four isotherm models, the scientists created a correlation between physico-chemical properties of the activated carbon and adsorption process. Cobb et.al have carried out research on acetic acid removal by coconut shell activated charcoal [4]. They tried to remove two types of impurities from waste water. First was suspended solid and second one was microbial pathogens. It was observed that that activated charcoal has the capacity to remove these toxic chemicals from waste water and activated carbon was the most cost effective and most efficient activated material.Adsorption of 2, 4-Dichlorophenoxyacetic acid onto date seeds activated carbon was investigated by Salman and Soud [5]. They carried out research on three adsorption isotherms model in which Langmuir isotherm model showed good adsorption capacity as compared to other two isotherm models. The adsorption capacity of Langmuir isotherm model was 175.4 mg/g. Kaur and Vohra have carried out research on study of bulk liquid membrane as a separation technique to recover acetic and propionic acids from dilute solutions [6]. They observed that groundnut shell can remove variety of species and this technique was more energy efficient. Ouattara et.al. investigated the adsorption of acetic acid on different carbon materials [7]. The adsorbing material was cheap. They also observed that the capacity of inactivated carbon doubles by reducing carbon in powder form. The Researchers Hussain et.al carried out research on adsorption studies of acetic acid on the surface of alternentheratrianda[8]. Acetic acid adsorption on alternentheratrianda using batch adsorption process was investigated. They studied the effects of various parameters on adsorption and tested it by Freundlich and Langmuir isotherm. Also they reported the various thermodynamic properties such as Gibb's free energy, enthalpy and entropy. Goodhead et.al worked on adsorption of acetic acid, cadmium ions and iodine using activated carbon from waste wood and rice husk'[9]. The study included moisture content determination of the raw materials used in the activation and carbonization processes. They investigated effects of variations in carbonization temperature and concentration of activating agent Laboniahsan et.al studied the recovery of acetic acid from prehydrolysis liquor of kraft hardwood dissolving pulp using ion exchange resin[10]. The adsorption of acetic acid from activated carbon treated prehydrolysis liquor was studied on tertiary and quaternary amine based resins. The tertiary amine based resin demonstrated the better efficiency. The

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***Mrunmai Joshi:** Chemical Engineering Department, DattaMeghe College of Engineering, Airoli, Navi Mumbai, Maharashtra, India. Pin:400708*

***Nikita More:** Chemical Engineering Department, DattaMeghe College of Engineering, Airoli, Navi Mumbai, Maharashtra, India. Pin:400708*

***Deepa Gaikwad**: Chemical Engineering Department, DattaMeghe College of Engineering, Airoli, Navi Mumbai, Maharashtra, India. Pin:400708*

***Sunil Kulkarni:** Chemical Engineering Department, DattaMeghe College of Engineering, Airoli, Navi Mumbai, Maharashtra, India. Pin:400708*

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results show that 66 to 84% of acetic acid desorption occurred using 4% NaOH. Okeola et.al.have investigated the acetic acid removal by activated carbon prepared from Jatrophacurcas fruit pericarp and seed coat[11]. Activated carbon was prepared from fruit pericarp and seed coat. The results indicated that activated carbon made from both parts of fruits acts as effective adsorbents. It was concluded that activated carbon from jatrophacurcas can be used for the removal of organic and especially inorganic substances from water and effluents.Abbasi and Alikarami have investigated the kinetics and thermodynamics of acetic acid adsorption from aqueous solution by peels of banana[12].Tabatabaee et.al. have reviewed the studies of haloacetic acids adsorption onto granular activated carbon from drinking water [13].The Adams–Bohart model was used to examine the experimental data and the model parameters were evaluated. Langell et.al have investigated the removal of acetic acid on hydroxylated NiO(111) thin films. It was observed that when Ni (100) has been exposed to O_2, 3 monolayer crystalline NiO(111) thin films were formed. The films were characterized by HREELS, XPS, AES and acetic acid adsorption[14].

III. CONCLUSION

Many investigators have examined the use of natural ingredient as raw material for preparation of activated carbon It was observed that activated carbon made from crop can be used as an effective adsorbent. The activated carbon prepared from the J. curcas pericarp and activated with NaCl (JPS) were effective at lower solute concentration and large quantity of activated carbon dosage was required. Equilibrium adsorption data fitted well with the Langmuir isotherm in most of the cases. The coconut husk adsorbent for removal of organic pollutants from aqueous solution was very efficient and economical for the removal of organic pollutants from waste water. About 92-99 percentage pollutants removal was possible. The raw materials i.e.coconut shell, rice husk, ground nut shell, olive seeds etc. were used for low cost adsorbent.

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Author Profile

Mrunmai D. Joshi studying in Datta Meghe College of Engineering, Airoli- Navi mumbai . Her area of researched include adsorption and environmental studies.

Nikita N. More is studying in Datta Meghe College of Engineering, Airoli Navi Mumbai. Her area of researched include adsorption and environmental studies.

Deepa S. Gaikwad is studying in Dattameghe college of engineering, Airoli – Navi Mumbai. Her area of research include adsorption and environmental studies.

Sunil J. Kulkarni has completed his Masters in Chemical Engineering from Tatyasaheb Kore Institute of Engineering and Technology, Warananagar. He is working as Assistant Professor in Chemical Engineering Department of Datta Meghe College of Engineering, Airoli, Navi Mumbai,

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India. He has published more than 20 international review and research papers and presented 15 research papers in international conferences.

His area of research includes adsorption, clean technology and environmental engineering. He is member of many professional bodies such as ISTE(Indian Society of Technical Education). He is on the reviewer board of many international journals andhas reviewed many international papers.

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