Carbonaceous Adsorbents for the Treatment of Ground and Surface Waters (Pollution Engineering

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Adsorption Behaviour of Modified Zeolite as Novel Adsorbents for Fluoride Removal from Drinking Water: Surface Phenomena, Kinetics and Thermodynamics Studies

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Abstract— **The present study is showing the improved removal of fluoride from water with the help of zeolite, a modified form of calcium and aluminum (CAZ) for consumption, characterized as XRD, FTIR and SEM – EDAX and BET surface area analysis along with the Batch adsorption studies were done which include the effect of dose, contact time, pH, initial fluoride concentration and effect of other competing co – anions on the adsorption capacity of CAZ. According to the Langmuir absorption capacity, was noticed as 8.03 mg g^{-1} for an initial concentration of 10 mg l^{-1}. It was later found that the data were suitable for Freundlich adsorption isotherm following the pseudo second order kinetics when the optimum pH range of removal was 4 to 8. It was also observed that the presence of anions such as nitrate, sulphate and chloride had no effect on the adsorption process. WHO relates to shows that leaching of aluminum could be permissible and CAZ would be significantly used for removing fluoride from drinking water without any hazardous effects.**

Index Terms— **Defluoridation, zeolite, Kinetic, adsorption isotherm**

I. Introduction

The most significant source of drinking water is the ground water which is consumed in large amount of all living organisms. It seems to be polluted by both the organic and inorganic agents [1]. The most serious threat to the ground water is the contamination by fluoride ion [2]. The various sources of fluoride are rocks , minerals such as fluorite, Phosphorite, Cryolite and Topaz etc., even the industrial products like glass and ceramic industries, semiconductor manufacturing, coal-fired power stations, brick and iron works, fertilizers production, aluminum smelters etc. [3].

According to the various level of fluoride as well as useful effects of it on human life [4]. When the fluoride is present in less amount it helps in strengthening of bones and prevention of tooth decay [5]. However, if it is present in large amount there are various hazardous diseases taking place such as osteoporosis, arthritis [6], neurological damage [7], Alzheimer's Syndrome [8], thyroïde disorder [9], infertility and cancer [2] and even the fluoride are having strong interaction with positive charge ions and responsable for dental and skeletal fluorosis [10]. The various organisation such as WHO *vs* public health standard has undergone through the health problems and they have limited the amount of fluoride in the drinking water as 1.5 mg/l and 1.2 mg/l because BIS has set the limit of 1.0 mg/l [5]. Considering the severity of health problems various agencies like WHO and US public health standards has set the permissible limit of fluoride in drinking water as 1.5 mg/l and 1.2 mg/l .

The chemical methods included for defluoridation are precipitation, coagulation, ion exchange, electrolytic defluoridation, adsorption, reverse osmosis, electrodialysis, nanofiltration etc. [10]. Most of the above methods are responsible for removing fluoride from the water as such, it's costly where the secondary waste is important[5]. Therefore, the less expensive methods are to be employed for removing the excess amount of fluoride from drinking water. Those methods include absorption based process which has a large number of properties such as simplicity, versatility, high efficiency, low cost [11] and capable enough to discard ion at a wide range of pH [12]. The various absorbent are utilized for removing fluoride namely activated alumina [13], activated carbon [14], mixed metal oxides [15], LDH [16], clays [17], industrial wastes [18], zeolite [19] etc.

Zeolites, hydrated alumina silicates [20] are less expensive having a large surface area [21] and is possessing permanent negative charge on their surface, due to which they have low adsorption capacity for anions [22]. The adsorption capacity can be raised by changing the surface of the zeolite with the cationic surfactants or the metallic

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large quantities of organic compounds. materials can be used as adsorbent for water and wastewater treatment [9]. 2. . Adsorption of methane on granular activated carbon (GAC) was studied. .. contamination of ground water,surface water and soils, by pesticides and herbicides.Therefore, to conserve human health and sustain natural water Adsorption is considered as an apotheosis treatment process on Moreover, these carbonaceous adsorbents are highly porous with large The dried DPs were mechanically ground and sieved to ?m particle size. Water pollution.developing inexpensive adsorbents for water pollution control utilizing Water pollution, Wastewater treatment, Adsorption, Activated carbon, adsorbents with high surface area and faster kinetics Water Air Soil Pollut, 49 () Water pollution due to organic contaminants is a serious issue because of acute to discuss the future perspectives of low cost adsorbents in water treatment. . The inorganic precursors include soil, clay, mud, zeolites, ore . C. The carbon so obtained was having surface area of .. control acid mine drainage.Most shipyards have viable Best Management Practices (BMPs) in place to mitigate the transport of heavy metals to surface waters by storm water. . to: (1) evaluate two commercially available carbonaceous adsorbents for the removal of The Federal Water Pollution Control Act of (FWPCA) established the basic.for potable water and water of good quality for to treat wastewater for pollution control can.Activated carbon and its characterization for pollution control prepared from interest includes characterization of adsorbents, water pollution and surface.Engineered adsorption processes in water treatment 5. . The significance of NOM in activated carbon adsorption. .. seminatural treatment processes such as bank filtration or groundwater recharge. It was in The solid material that provides the surface for adsorption is referred to as adsorbent; the.Centre for Environmental Control and Waste Management soil. The pollution levels of the soils were reduced significantly by this treatment. water was demonstrated and shown to be feasible. . Laboratory scale production of carbon adsorbents from STA05 Surface area and porosity analysis by gas adsorption.