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Spectroscopic Study of some Agricultural Wastes for Use

Thesis

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إهداء

أهدى هذا العمل إلي أبي رحمة الله لانة زرع في قلبي حب العلم وأمي الغالية فكان سر نجاحي هو دعائها وتشجيعها لي جزاها الله عني خير الجزاء وادعوا لها بطول العمروالسعادة. كما أهديها إلي إخوتي اذ لهما الفضل في مساندتي في اتمام هذا العمل فهم جميعا كانوا قدوة لي في الصبر والعزيمة ادعوا الله عز وجل ان يحفظهم ويبارك فيهم جميعا ويكتب لهم الفردوس الأعلى هم وأولادهم وزوجاتهم. كما اهديها إلي أختي الغالية وزوجها وأولادها بارك الله فيهم ووفقهم لما يحبة ويرضاه. كما أهديها إلي صديقاتي الأفاضل علي نصائحهم لي بارك الله لي فيهم وادعوه بدوام هذة الصداقة. كما أهديها إلي كل أهلي وأحبائي وكل من دعا لي بالتوفيق والنجاح.

والله ولي التوفيق

Abstract

Agricultural wastes are generated in high amounts in Egypt; these products, such as rice straw, are not used economically. It can be used as adsorbent in aqueous solution to remove heavy metals and used as forage for ruminant. Adsorption experiments were carried out using rice straw to adsorb some heavy metals like Cd, Cu, Fe, Mn, Ni, Pb and Zn from aqueous solution. It was treated with two different methods acid treatment and alkali treatment in order to increase their metal-binding capacity and protein to use as forage for ruminant. The adsorption process is affected by various parameters such as contact time (30-120min), solution pH (2–10), and adsorbent amount (0.25-1.5 g). The equilibrium time was taken as 90 min for all elements, except Cu at 120 min. The optimum pH required for maximum adsorption was found to be 2 for Pb and 7 for other elements and for adsorbent amount was found 1g. All concentrations of heavy metals were determined by Flame Atomic Absorption Spectrometer (FAAS). Also Fourier Transform Infrared Spectrometer (FTIR) in the range 4000–400 cm^{-1} was used to determine the percent of protein in raw rice straw and treated straw. Results indicated that rice straw treated with CaO appeared to be the most practical for use on adsorption heavy metals from aqueous solution. The modified rice straws could adsorb metal ions faster than unmodified. It was found that a combination of urea plus CaO was the most effective treatment for improving protein in rice straw.

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Chapter (1)
Introduction

Egypt as an agriculture country is the largest rice producer in the Near East region. In fact, the Egyptian rice yield is one of the highest in the world (9.1 tons per hectare in 2001) [(1)]. Its production is concentrated in Delta zone. Usually, rice is planted in May and harvested in October. Much of the agricultural byproduct streams in Egypt are not used economically. Rice straw is considered as an agriculture waste material, its amount discarded annually in Egypt is around three million tons [(2)]. At harvesting time, the rice straw is burnt to release nutrients for the next growing season and to get rid of the huge quantity of it. The burning process of rice straw leads to emission of choking smoke which causes the 'black cloud' phenomenon and affects on visibility, human health and global climate by emitting particulate matters and other gaseous pollutants. In this work rice straw used as feeds for ruminants and for removing heavy metal ions from aqueous solution in Egypt.

Environmental pollution caused by toxic heavy metals is one of the most pressing problems in many densely populated cities worldwide. The industrial and domestic wastes responsible for various damages to the environment adversely affect the health of the human population. According to the World Health Organization (WHO), the metals of most immediate concern are Aluminum, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc,

Cadmium, Mercury and Lead [3]. Cadmium compounds are especially dangerous and highly toxic. Cadmium toxicity contributes to a large number of health conditions, including the major killer diseases such as heart disease, cancer and diabetes. Cadmium concentrates in the kidney, liver and various other organs and is considered more toxic than either lead or mercury [3]. Lead is one of these heavy metals, and can be introduced into liquid wastes from different industries [4]. It accumulates mainly in bones, brain, kidney and muscles and may cause many serious disorders like anemia, kidney diseases, nervous disorders and sickness even death[5]. Copper is the third most used metal in the world [6]. Copper is an essential micronutrient required in the growth of both plants and animals. In humans, it helps in the production of blood hemoglobin. In plants, Cu is especially important in seed production, disease resistance, and regulation of water. Copper is indeed essential, but in high doses it can cause anemia, liver and kidney damage, and stomach and intestinal irritation. Nickel is an element that occurs in the environment only at very low levels and is essential in small doses, but it can be dangerous when the maximum tolerable amounts are exceeded. This can cause various kinds of cancer on different sites within the bodies of animals, mainly of those that live near refineries. Zinc is a trace element that is essential for human health. Zinc shortages can cause birth defects. Drinking water contains certain amounts of Zn, which may be higher when it is stored in metal tanks. Industrial sources or toxic