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Extended Abstract
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Stereochemistry 2016: The remediation of contaminated water from heavy metals (Ni+2, Zn+2) using coffee husk as a green sorbent material

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Wastewater contamination is a problem, which the whole world is now facing. Industrialization and globalization has led to the production and disposal of large amount of heavy metals in the environment resulted in an increase flux of metallic substances in the aquatic environment. Removing of heavy metals from contaminated water using biomass materials is a modern technology, which is characterized with low cost, high efficiency, renewable source, and availability. Biomass sorption such as coffee bean, chaff, rice husk and peelings from trunk of palm tree were investigated. In this study, coffee husk has been used as sorbent material, batch experiment was performed to study adsorption potential of coffee husk at initial concentration of 400 ppm with different contact time, concentration, pH and temperatures with the (Ni, Zn) metal concentration measured by ICP-OMS. The scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDX) was used for characterization studies. The results showed that the equilibrium contact time was 90 minutes and the average removal efficiency was 60% for Ni+2 and 45% for Zn+2. The adsorption capacity of the sorbents was 12.34, 10.30 mg/g for Ni+2 and Zn+2 respectively. The adsorption data was applicable on Langmuir and Freundlich isotherm models and adsorption of Ni and Zn ions perfectly follow the pseudo-second-order kinetic model. The present investigations revealed that the coffee husk as biomass sorbents could be a sufficient removal of heavy metals from wastewaters.

Nickel is a chemical element with the symbol Ni and the atomic number 28. It is a shiny silvery white metal with a slight golden hue. Nickel belongs to the transition metals. Also its is ductile and hard. Despite this, pure native nickel is only found in the earth's crust in small amounts, usually in ultramafic rocks, and inside larger nickel-iron meteorites that have not been exposed to oxygen. outside of the Earth's atmosphere. Meteoric nickel is found in combination with iron, reflecting the origin of these elements as the main end products of supernova nucleosynthesis. It is believed that an iron-nickel mixture makes up the outer and inner nuclei of the Earth. Nickel is slowly oxidized by air at room temperature and is considered to be corrosion resistant. Historically, it has been used for the plating of iron and brass, the coating of chemical material and the manufacture of certain alloys which maintain a high silver polish, such as German silver. Still, around 9% of the world nickel production in utilized for corrosion-resistant nickel plating. Sometimes, nickel-plated objects cause an allergy to nickel. Nickel has been widely used in coins, although its rise in price has resulted in replacement by cheaper metals in recent years.

Nickel is one of the four elements (the others are iron, cobalt and gadolinium) which are ferromagnetic at around room temperature. Alnico permanent magnets based in part on nickel have an intermediate resistance between permanent iron-based magnets and rare earth magnets. Metal is precious in modern times mainly in alloys; around 68% of world production is used in stainless steel. An additional 10% is used for nickel-based and copper-based alloys, 7% for alloy steels, 3% in foundries, 9% in plating and 4% in other applications, including the fast growing batteries. As a compound, nickel has a number of niche chemical manufacturing uses, such as a catalyst for hydrogenation, battery cathodes, pigments and metallic surface treatments. Nickel is an essential nutrient for certain microorganisms and plants that have enzymes with nickel as the active site.

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Zinc is a chemical element with the symbol Zn and the atomic number 30. At room temperature, Zinc is a slightly fragile metal. Also, when the oxidation is removed, it has a blue-silver appearance. Among the group 12 of the periodic table, it is the first element. Chemically, zinc is similar to magnesium in some respects. In the earth's crust, zinc is the 24th abundant element. Also, it has five stable isotopes.

Sphalerite (zinc blende), a zinc sulphide mineral is the most common zinc ore. The largest usable veins are found in Australia, Asia and the United States. Zinc is refined by foam flotation of the ore, roasting and final extraction using electricity (electrolytic extraction). The element was probably named by the alchemist Paracelsus after the German word Zinke (tooth, tooth). German chemist Andreas Sigismund Marggraf is known to have discovered pure metallic zinc in 1746. The work of Luigi Galvani and Alessandro Volta revealed the electrochemical properties of zinc in 1800. Zinc-resistant corrosion of iron (hot-dip galvanization) is the main application of zinc. Other applications relate to electric batteries, small non-structural molded parts and alloys such as brass. Various zinc compounds are commonly used, such as zinc carbonate and zinc gluconate (as food supplements), zinc chloride (in deodorants), zinc pyrithione (dandruff shampoos), zinc sulfide (in luminescent paints) and dimethylzinc or diethylzinc in the biological laboratory. Zinc is an essential mineral, including for prenatal and postnatal development. Zinc deficiency affects around two billion people in developing countries and is associated with many diseases. In children, a deficiency leads to stunted growth, delayed sexual maturation, susceptibility to infections and diarrhea. Enzymes with a zinc atom in the reactive center are common in biochemistry, like alcohol dehydrogenase in humans. Consuming excess zinc can cause ataxia, lethargy and copper deficiency.

Zinc is a bluish white, shiny and diamagnetic metal, although most common commercial shades of the metal have a matte finish. At most temperatures, the metal is brittle and hard. But between 100 and 150 ° C, it becomes malleable. Above 210 ° C, the metal becomes brittle again and can be sprayed by threshing. Zinc is a good conductor of electricity. For a metal, zinc has relatively low melting and boiling (419.5 ° C) and boiling (907 ° C) points. The melting point is the lowest of all the block metals apart from mercury and cadmium. Smithsonite (zinc carbonate), hemimorphite (zinc silicate) etc. are some of the other source minerals for zinc.

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