Investigation of Removing Ionic Metals of Ni(II) and Cd(II) from Aqueous Solution by a Polyacryl Amid Adsorbent

M. Abedpour[1], B. Kamyab Moghadas[2*]
1- M. Sc. Chemical Engineering, Shiraz Branch, Islamic Azad University, Shiraz, Iran
2- Assistant Professor, Department of Chemical Engineering, Shiraz Branch, Islamic Azad University, Shiraz, Iran
Email: kamyab@iaushiraz.ac.ir

Abstract
Today, with the expansion of the chemical industry, we see heavy metals enter the surface water and wastewater, which is certainly associated with toxic exposure. Therefore, in this study, a polyacrylamide polymer adsorbent was synthesized for simultaneous removal of nickel and cadmium in an aqueous medium, and the effect of different parameters on simultaneous removal of these two metals was investigated. The optimum conditions for simultaneous removal at pH 4.86, the adsorbent amount of 0.016 g, the contact time of 6.48 minutes and the concentration of nickel and cadmium solutions were 15.01 and 15 mg / l, respectively. The optimum removal rates for nickel and cadmium were 84.5% and 81.03%, respectively. According to the results of this study, polyacrylamide adsorbent can be used as an effective adsorbent in the simultaneous removal of nickel and cadmium from aqueous solutions.

Keywords: Adsorption, Polyacrylamide Adsorbent, Simultaneous Removal, Nickel (+2), Cadmium (+2).

❐❐❐❐

Unsteady-State Film Model: Simultaneous Reactive Absorption of Two Gases

A. Ghaemi
Professor of Chemical Engineering, Iran University of Science and Technology
Email: aghaemi@iust.ac.ir

Abstract
In this work, a film model has been developed to describe unsteady state simultaneous absorption of two gases. Film modeling of reactive absorption results in initial boundary-value problem. The analytical solution applied in this work is a combination of the superposition principles and the separation of variables methods. The concentration equations obtained in the model contain two independent variables of time and film width. Therefore, solving the model gives component concentrations at any time or film length. In addition, the partial differential equations were solved numerically. The experimental data were obtained using laboratory packed column. The model results were validated using experimental data. A comparison between the model results and experimental data indicates that the model has good agreement with experimental data.

Keywords: Film Model, Simultaneous Reactive Absorption of Two Gases, Unsteady-State Modeling.

Two-Dimensional Heterogeneous Simulation of Methane Steam Reforming Catalytic Reactor

A. R. Khajeh-Amiri[1*], M. Khajeh-Amiri[2]
1- PhD of chemistry, NEZAJA Self-Sufficiency Jihad Research Organization Aja University of Medical Sciences, Tehran, Iran
2- School of Chemical, Petroleum and Gas Engineering, Iran University of Science and Technology (IUST), Tehran, Iran
Email: a_khajehamiri@yahoo.com

Abstract
In this paper, a two−dimensional heterogeneous reactor model was employed to predict the performance of a methane-steam reformer. External and internal effects for heat and mass transfer were included into the model. The set of coupled differential equations was solved numerically. To study the effects of different parameters, such as temperature, pressure,steam-to-methane ratio,simulation was performed and the results compared against data from an industrial reformer. A good agreement between the simulation and the industrial data is seen, indicating the efficiency of the mathematical model. Also the percentage error was between 1% and 10% for various cases (such as: temperature, pressure and etc.)

Keywords: Synthesis Gas, Methane Reforming, Heterogeneous Two-Dimensional Model.

❐❐❐❐

Chemical Exposure Risk Assessment Using Semi-Quantitative Risk Assessment Method (Case Study: Automobile Tire Manufacturing Factory)

D. Kahforoushan[1*], P. Mashkouri[2], M. Mohammadi[3]
1- Associate Professor of Chemical Engineering, Sahand University of Technology, Tabriz, Iran
2- M. Sc. in Chemical Engineering, Islamic Azad University, Ahar Branch, Iran
3- M. Sc. in Energy Systems Engineering, Sahand University of Technology, Tabriz, Iran
Email: kahforoushan@sut.ac.ir

Abstract
In this paper, the risk of chemicals existing in one of the automobile tire manufacturing industries has been investigated using a semi-quantitative risk assessment method. This research is based on the pattern which is provided by the Singapore professional health department to assess the risk of chemicals in the factory. The results showed that the tested employees in this study are in contact with 28 different chemicals. Among these chemicals, benzene, vinyl chloride and solvent 410 are at very high risk. Vinyl chloride is used in units of banbury, extruder and semenzeni. Benzene is used in extruder unit and solvent 410 is used in extruder, baking and inspection units. Due to the high-level risk of these chemicals, safety measures should be taken into account in targeted factory as soon as possible to safeguard employees.

Keywords: Risk Assessment, Automobile Tire Manufacturing Factory, Chemicals, Toxicity.

Adsorption of Pb (II) from Aqueous Sample Using Nanocomposite Based on Polyethersulfone/Amine-Functionalized Carbon Nanotubes

P. Zahedi[1*], M. Jamshidian[2], A. Sohrabi[3], E. Ghasemi[4]

1- Assistant Professor of Polymer Engineering, University of Tehran

2- M. Sc. in Polymer Engineering, University of Tehran

3- M. Sc. in Chemical Engineering, University of Tehran

4- Professor of Polymer Engineering, Iran Polymer and Petrochemical Institute (IPPI)

Email: phdzahedi@ut.ac.ir

Abstract

Adsorption of lead metal ion [Pb(II)] from aqueous samples was investigated using polyethersulfone (PES)/amine-functionalized carbon nanotubes (NCNTs) via changes of pH, stirring speed, contact time, adsorbent content and initial metal ion concentration. The FTIR and EDX results for the modified sample showed that the first type amine groups (N-H_2) and the second type amine groups (N-H) were located on the CNT surface. The SEM images also showed CNTs structure change, their breaking down followed by providing more order. The rate of ion adsorption by the nanocomposite sample showed that the kinetic equilibrium of adsorption occurred within the first 10 min of contact time. To maximize the metal ion removal, the amounts of nano-adsorbent, pH and initial ion concentration were determined 0.1 g/100 mL aqueous sample, 7, and 95 ppm, respectively. Also, the Freundlich isotherm model and the pseudo-second order kinetic model had the best correspondence with the experimental data.

Keywords: **Carbon Nanotubes, Functionalization, Lead Metal Ion, Polyethersulfone, Adsorption, Nanocomposite.**

❐❐❐❐

The Cyanide Bio-Removal: Enzymatic Pathways, Microorganisms and Affecting Operational Parameters

A. Khezri[1], L. Vafajoo[2*], M. Jokar[3]

1- M.Sc. Student, Chemical and Polymer Engineering Department, Islamic Azad University, Tehran South Branch, Tehran, Iran

2- Associate Professor, Chemical and Polymer Engineering Department, Islamic Azad University, Tehran South Branch, Tehran, Iran

3- Assistant Professor, Cotton Research Institute of Iran, Agricultural Research, Education and Extention Organization (AREEO), Gorgan, Iran

Email: vafajoo@azad.ac.ir

Abstract

Cyanides uptake is one of the priorities of the wastewater treatment plants of the industry, because of its high toxicity and harmful effects on the environment. There are numerous physical and chemical methods for Cyanide removal, some of which are not cost-effective or create some hazardous side products. Thereby, utilizing the bio-removal processes as the cheap and bio-friendly method are taken into consideration. The Cyanide bio-removal proved to be the most effective method which possesses the possible removal pathways with the well-known enzymes. The present research aimed to investigate the Cyanids bio-removal pathways and to illustrate the most affecting operational parameters on this process. The information expressed in this article might be useful for some chemical engineers who work in industrial wastewater treatment facilities to assess the optimum operating conditions for Cyanids bio-uptake.

Keywords: **Cyanide, Biological uptake, Microorganism, Enzyme, Removal Pathways.**