



Grafting, cross-linking and blending of chitosan as adsorbent Cr (VI) ions from artificial waste water with adsorption-fluidization method

Suyanto

Department of Chemistry, Faculty of Science and Technology, Airlangga University, Surabaya, Indonesia

ABSTRACT

In this research chitosan was grafting with chloroacetic acid and it was cross-linking with urea-oxalic acid to form carboxymethyl-urea-oxalic acid (CMChi-UOX). The CMChi-UOX was blending with silica gel, to form blend Silica gel-carboxy methyl-urea-oxalic acid (Si-CMChi-UOX). Adsorption-fluidization Cr(VI) ions from artificial waste water were carried out in fluidized bed. The fluidized bed was filled with 200 ml artificial waste water and added amount 0.5 gram of adsorbent. The variable in this research are variety of times, temperatures and pH. The adsorption-fluidization capacity of CMChi-UOX and Si-CMChi-UOX onto Cr(VI) ions respectively were written in percent, 93.32% and 94.95% respectively, or the standard can be written as mg adsorbate/g adsorbent, 37.33 and 37.98 respectively. The order rate of adsorption-fluidization for CMChi-UOX to Cr(VI) ions is order 1 and order 2, whereas the process of adsorption-fluidization is spontaneous. The parameter thermodynamics are $\Delta H = 468.8347 \text{ J mol}^{-1}$ adsorbate, $\Delta G = 1.2913 \text{ J mol}^{-1}$, $\Delta S = 1.3631 \text{ J mol}^{-1} \text{ K}^{-1}$ and the process adsorption-fluidization was following Freundlich isotherm.

Key words: CMChi-UOX, Si-CMChi-UOX, adsorption-fluidization, Cr(VI) ions.

INTRODUCTION

Adsorption is process to absorb on an adsorbent surface, the compounds was attached to adsorbent known as adsorbate and compounds which is adsorb known as adsorbent [1]. Generally, adsorption use solid compounds as adsorbent; solid adsorption, including physics adsorption (by force of Van der Waals); and chemist adsorption (adsorbate molecules react with adsorbent surface through covalent or ionic bonding [2]. Adsorption isotherm are including Freundlich, Langmuir, Temkin, Redlich-Paterson, Sips and Dubini-Radushkevich isotherm [3,4]. Adsorbent have to big surface area and adsorption capacity. It does not dissolved in adsorbate whereas some influenced adsorption factors are types of adsorbent and adsorbate, surface area of adsorbent, adsorbate concentration, and adsorption temperature [5].

Fluidization is process or operation which fine particles are converted to behave like fluid when they are contacting the fine particles with liquid or gas [6,7]. Fluidization is used in industries, but fluidization is a new method in adsorption. Fluidization is influenced by some factors, such as system fluidization (gas-solid, solid -liquid, gas-solid-liquid) and rate of gas flow [6].

Clean water is vital thing for human health, such as for drinking and cooking. WHO international standard of Cr(VI) sequence maximum concentration for using of water domestic is 0.05 mg/l, whereas the limit standard concentration for ground water drinking is rejected in 0.05 mg/l [8,9]. As a vital thing, clean water is also necessary for washing,