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First page example

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Study on Adsorption Characteristics of Ni (II) by Palygorskite

Lin Shaohua[1, a], Li Jierui[2, b], Wang Zheng[1, c] and Jing Zhaoqian[1, d]

[1]School of Civil Engineering, Nanjing Forestry University, Nanjing 210016, P.R. China

[2]Shandong Jianzhu Universities, Jinan, P.R. China

[a]franklinsh@126.com, [b]ljery@sdai.edu.cn, [c]njfuwangzheng@163.com, [d]carljing@163.com

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Introduction

Excessive nickel can cause nose cancer, lung cancer and leukaemia, etc[1,2], although nickel is one of the essential elements in human being organism. Therefore, the pollution of nickel has been paid close attention to over the years. And a number of technologies for the removal of Ni (II) ion from aqueous solutions have been developed. The most important of these techniques include chemical precipitation, ion-exchange, reverse osmosis, membrane systems, etc. However, all these techniques have their inherent limitations in application.

Palygorskite, the main component phase of palygorskite clay, is a crystalline hydrated magnesium silicate with a fibrous morphology. Owing to isomorphic substitution during its formation, palygorskite particles can absorb many exchange cations. Its porous structure and absorbed cations provide it with large specific surface area and moderate cation exchange capacity for the adsorption of heavy metals from solution. Study on adsorption of heavy metal ions, including Ni (II), using palygorskite has been performed[3]. However, effects of heat- and acid-treatment, which could change the properties of palygorskite, on adsorption capacity for Ni (II) weren't reported in this literature.

In the present study, palygorskite clay from Jiangsu, China was selected as an adsorbent, and the adsorption characteristics of Ni (II) by the palygorskite were investigated. The effects of parameters such as contact time, amount of the adsorbent, roasting temperature, acid concentration for activation on adsorption capacity for Ni (II) were studied. And the effects of roasting temperature, hydrochloric acid concentration for modification were discussed in particular.

Experimental

Chemicals and Reagents The palygorskite clay, obtained from the palygorskite clay mines in Xuyi of Jiangsu province, China. Quartz impurities were removed by fractionation using conventional sedimentation techniques. Then palygorskite was milled with stainless steel balls, and the resulting powder was dried at 378±2K (105±2°C).

Activated palygorskite samples were obtained according to the following procedure: (1) acid-activation series: 20g palygorskite was immersed in 100mL HCl solution with various concentrations (0.5,1,2,3, 4,5, 6 and 7M) in shaker at 298K(25 °C) for 3 h, and then washed with deionized water for many times until pH of 6.0 was achieved. The activated palygorskite was milled with stainless steel balls and dried at 378±2K (105±2°C) again. (2) Heat-activation series: 10g