Adsorption of Cd(II) from wastewater using spent coffee grounds by Taguchi optimization

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ABSTRACT

This study evaluated the feasibility of employing spent coffee grounds (SCG) as adsorbent for removing Cd(II) from wastewater. The Taguchi experimental design was applied to determine the optimum adsorption condition. The controllable factors of the treatment procedure of SCG, initial concentration of Cd(II), SCG dose, contact time, and temperature were optimized. The contribution of each controllable factor was also explored. The results showed that the influencing degree of the controllable factors of Cd(II) removal in decreasing order was: concentration of Cd(II) > dose of SCG > treatment procedure of SCG > temperature > contact time. On the other hand, the Cd(II) removal efficiency of SCG in descending order was degreased by solar energy > washing by boiling DI water > washing by DI water; namely, the SCG degreased by solar energy was more effective to adsorb Cd(II) than the other two. Moreover, both results of Langmuir and Freundlich adsorption isotherms adopted to model the equilibrium adsorption data also showed that solar energy degreased SCG was the most effective adsorbent for Cd(II) with the maximum adsorption capacity of 5.46 mg/g.

Keywords: Taguchi method; Adsorption; Spent coffee grounds; Cadmium; Solar energy

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