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Preparation And Characterisation Of Adsorbent From Landfill Sludge

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EXTENDED ABSTRACT

One of the materials that can be used to produce activated carbon is sludge from municipal solid waste (MSW) in landfills. Large amount of sludge is usually generated as waste from leachate treatment process, creating sludge disposal problem. At the same time, the presence of heavy metals in the water as a result of industrial activities is a matter of concern. For these reasons, the aims of this research are to produce adsorbent from leachate treatment process sludge for copper removal and to characterise the synthesised adsorbent. The sludge was treated by physical and chemical methods and carbonised at 400, 600, and 800 °C to produce activated carbons P400, P600, P800 and C800, respectively. The adsorbents were tested onto copper solution for their capability to adsorbed copper ion. The prepared sludge adsorbent were characterised by scanning electron microscopy (SEM), energy dispersive X-ray spectrometer (EDX), N2 adsorption-desorption analysis, thermogravimetric analysis (TGA), and Fourier transform infrared spectroscopy (FTIR). As a result, the highest percentage removal of copper ion was 73.04%. Thus, it was proved that sludge from MSW is a good adsorbent to remove heavy metal.

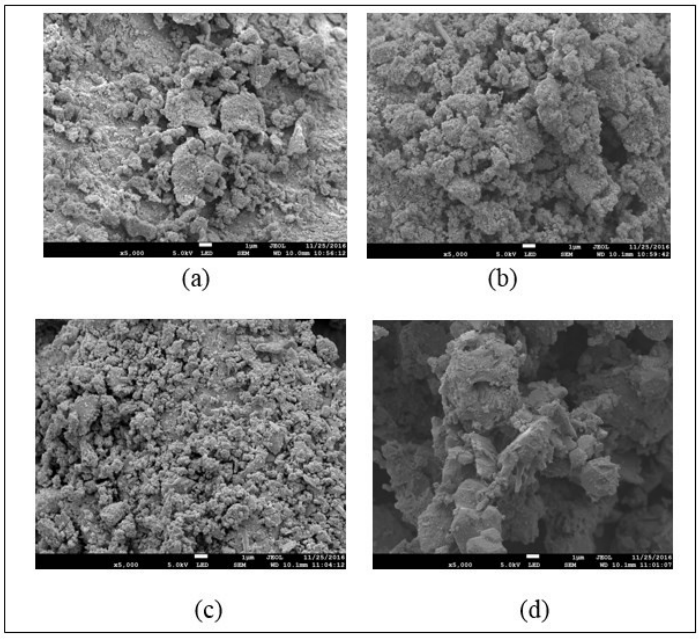

Figure 1: Surface images of (a) P400, (b) P600, (c) P800, and (d) C800 at 5000×.

Keywords: Activated carbon, leachate, sludge, heavy metal, adsorbent.

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References

[1] Sassi, M., Bestani, B., Said, A. H., Benderdouche, N., & Guibal, E. (2010). Removal of heavy metal ions from aqueous solutions by a local dairy sludge as a biosorbant. Desalination, 262(1), 243-250.

[2] Smith, K. M., Fowler, G. D., Pullket, S., & Graham, N. J. D. (2009). Sewage sludge-based adsorbents: A review of their production, properties and use in water treatment applications. Water Research, 43(10), 2569-2594.

[3] Simões dos Reis, G., Sampaio, C. H., Lima, E. C., & Wilhelm, M. (2016). Preparation of novel adsorbents based on combinations of polysiloxanes and sewage sludge to remove pharmaceuticals from aqueous solutions. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 497(Supplement C), 304-315.

[4] Velghe, I., Carleer, R., Yperman, J., Schreurs, S., & D'Haen, J. (2012). Characterisation of adsorbents prepared by pyrolysis of sludge and sludge/disposal filter cake mix. Water Research, 46(8), 2783-2794.

[5] Calisto, V., Ferreira, C. I. A., Santos, S. M., Gil, M. V., Otero, M., & Esteves, V. I. (2014). Production of adsorbents by pyrolysis of paper mill sludge and application on the removal of citalopram from water. Bioresource Technology, 166(Supplement C), 335-344.

[6] Wajima, T. (2017). A new carbonaceous adsorbent for heavy metal removal from aqueous solution prepared from paper sludge by sulfur-impregnation and pyrolysis. Process Safety and Environmental Protection, 112(Part B), 342-352.

[7] Abo-El-Enein, S. A., Shebl, A., & Abo El-Dahab, S. A. (2017). Drinking water treatment sludge as an efficient adsorbent for heavy metals removal. Applied Clay Science, 146(Supplement C), 343-349.