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## Adsorption capacity Zn, Pb, Cd, Cu with coconut fiber

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### Abstract

Coconut fiber is an agricultural waste generated in large quantities in Vietnam from the processing of coconuts. This article proposes to use coconut fiber as a sorption material for extracting heavy metal ions Zn, Pb, Cd, Cu from model solutions.

The optimal parameters of the sorption process were selected, such as sorption time, amount of sorbent, temperature, pH of the medium.

Coconut fiber was used in its native form. The residual concentration of heavy metal ions was determined by the voltammetric method using a Ta-Lab analyzer.

The maximum efficiency of the extraction of heavy metal ions from the solution was obtained under the following conditions: sorption time 60 minutes, temperature  $40 \pm 1$  °C, pH =  $6.0 \pm 0.01$ , the amount of sorbent was 0.2 g of coconut fiber per 20 ml of model solution. The cleaning efficiency was 94% for zinc ions, 94.5% for cadmium, 95% for lead and 89.8% copper.

Research has shown that natural coconut fibers are a good alternative sorbent for removing Zn, Pb, Cd, Cu from wastewater.

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### References

- [1] W. Boulaiche, B. Belhamdi, B. Hamdi, et al. Kinetic and equilibrium studies of biosorption of M(II) (M = Cu, Pb, Ni, Zn and Cd) onto seaweed *Posidonia oceanica* fibers. 2019. *Appl Water Sci* 9, 173p.
- [2] G. Crini, E. Lichtfouse, L.D. Wilson, N. Morin-Crini. Conventional and non-conventional adsorbents for wastewater treatment. 2019. Vol.17(1). P.195-213.

- [3] Leena Mishra, Gautam Basu. Handbook of Natural Fibres (Second Edition). Types, Properties and Factors Affecting Breeding and Cultivation. *Woodhead Publishing Series in Textiles*. **2020**. Vol.1. P.231-255.
- [4] Kotchaporn Taksitta, Prapasiri Sujarit, Nuanlaor Ratanawimarnwong, Suchao Donpuksa, Kriangsak Songsrirote, Development of tannin-immobilized cellulose fiber extracted from coconut husk and the application as a biosorbent to remove heavy metal ions. *Elsevier Environmental Nanotechnology. Monitoring & Management*. **2020**. Vol.14. P.100389.
- [5] S.R. Shukla, R.S. Pai, & A.D. Shendarkar. Adsorption of Ni(II), Zn(II) and Fe(II) on modified coir fibres. *Separation and Purification Technology*. **2006**. Vol.47(3). P.141-147.
- [6] M.A. Hossain, H.H. Ngo, W.S. Guo, L.D. Nghiem, F.I. Hai, S. Vigneswaran, & T.V. Nguyen. Competitive adsorption of metals on cabbage waste from multi-metal solutions. *Bioresource Technology*. **2014**. Vol.160. P.79-88.
- [7] H. Lou, X. Cao, X. Yan, L. Wang, & Z. Chen. Adsorption performance of Cd(II), Cr(III), Cu(II), Ni(II), Pb(II) and Zn(II) by aminated solution-blown polyacrylonitrile micro/nanofibers. *Water Science and Technology*. **2018**. Vol.2. P.378-389.
- [8] H. Radnia, A.A. Ghoreyshi, H. Younesi, and G.D. Najafpour. Adsorption of Fe(II) ions from aqueous phase by chitosan adsorbent: equilibrium, kinetic, and thermodynamic studies. *Desalin. Water. Treat.* **2012**. Vol.50(1-3). P.348-359.
- [9] R. Malik, S. Dahiya, & S. Iata. An experimental and quantum chemical study of removal of utmostly quantified heavy metals in wastewater using coconut husk: A novel approach to mechanism. *International Journal of Biological Macromolecules*. **2017**. Vol.98. P.139-149.
- [10] Nguyen Thi Truc Mai, Yu.A. Smyatskaya. Adsorption capacity Zn, Pb, Cd, Cu with coconut fiber. *Butlerov Communications*. **2021**. Vol.67. No.8. P.14-19. DOI: 10.37952/ROI-jbc-01/21-67-8-14 (Russian)