International Symposium on Setting their Table: Women and the Periodic Table of Elements
Feb. 11-12, 2019 - Murcia (Spain)
United Nations Educational, Scientific and Cultural Organization
2019 IYPT International Year of the Periodic Table of Chemical Elements

Kinetic of copper removal by adsorption on *Posidonia oceanica*

Mercedes Lloréns, María I. Aguilar, Juan F. Ortuño, Víctor F. Meseguer, Ana B. Pérez-Marín, Marta Nicolás.

Univ Murcia, Fac Química, Dept Ingeniería Química, Campus de Espinardo, Murcia 30071, Spain

Topic: The elements and the Periodic Table for sustainable chemistry

Abstract:

Copper is a common heavy metal, potentially toxic and extensively used in many sectors such as alloys production, electric and electronic component industry, construction, transport, etc. Adsorption is a highly effective method for heavy metal removal from water and wastewater and the use of a wide variety of low cost sorbents (biological material abundant in nature or by-product or waste material from industry) has been reported. The purpose of this work is to evaluate the use of non living leaves of *Posidonia oceanica* (*PO*), biological resource available at the Mediterranean Sea, as a low cost biosorbent material to remove copper from aqueous solutions. The effect of pH and adsorption kinetic has been investigated.

Adsorbent. Non living leaves of *PO* were collected from the beaches of Mediterranean Sea at the Region of Murcia, washed repeatedly with tap water, dried at 50 ºC-60 ºC, crushed and sieved. The particles with size between 0.5 mm and 2.5 mm were used.

Effect of pH. Copper solution (150 mg Cu(II)·L^{-1}) and sorbent (4 g·L^{-1}) were mixed and shaken at 20 ºC until the equilibrium was reached. The suspension pH was kept constant at the desired value (from 2 to 5) by addition of HNO_3 or NaOH solutions. The copper removal increased from 15 % at pH = 2 to 90 % at pH = 5 as result of changes in the solid surface charge and the competition between H^+ and Cu^{2+} for the active sites in the sorbent.

Biosorption kinetic. Batch kinetic assays were carried out at pH=5 and at 10 ºC, 20 ºC, 30 ºC and 40 ºC. Copper solution (150 mg Cu(II)·L^{-1}) was contacted with sorbent (4 g·L^{-1}) and the residual copper concentration was determined by AAS in samples collected at selected contact times. Initially the copper uptake was rapid (90 % of the equilibrium adsorption capacity was reached before the first 50 minutes at 10 ºC and before the first 20 minutes at 20 ºC, 30 ºC and 40 ºC). Afterwards, the removal rate diminished due to the approach to the equilibrium (reached before 50 minutes at 20 ºC, 30 ºC and 40 ºC) (Figure 1). The pseudo-first-order, pseudo-second-order, Elovich and intraparticle diffusion kinetic models were used to elucidate the biosorption mechanism [1]. The pseudo-second-order model provides the best correlation data.

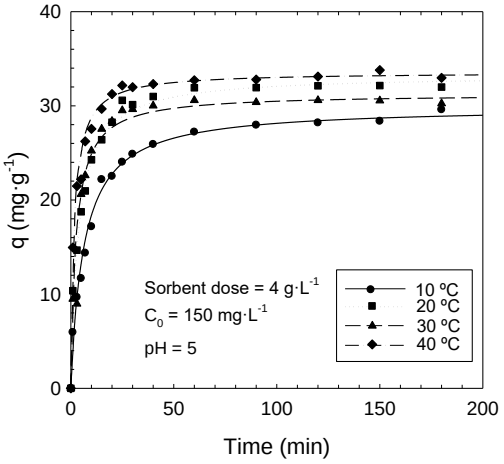

Figure 1. Adsorption kinetic

References

1.V.F. Meseguer, J.F. Ortuño, M.I. Aguilar, M.L. Pinzón-Bedoya, M. Lloréns, J. Sáez, A.B. Pérez-Marín *Environ. Sci. Pollut. Res.* **2016**, 23, 24032-24046.