Preliminary data on the absorption of Cr (III) and Cr (VI) ions in the metal oxide-based material derived from the quartz sand enrichment process.

Alma Shehu[1]
Majlinda Vasjari[(1)], ElianaTassi[(2)], Sonila Duka[(1)], Loreta Vallja[(1)], Nevila Broli[(1)], Francesca Bretzel[(2)], Roberto Pini[(2)], Lucia Giorgetti[(2)]

[1] University of Tirana, Faculty of Natural Sciences, Blv "Zogu I", Tirana, Albania
[2] Research Institute on Terrestrial Ecosystems (IRET) - Unit of Pisa. National Research Council of Italy (CNR), Via Moruzzi, 1 - 56124 Pisa - Italy

alma.shehu@fshn.edu.al

Abstract
In present study, a metal oxide based material, derived from the enrichment process of quartz coastal sand was used as adsorbent for the removal of chromium (III) and (VI) ions from solution. Following additional modification of the adsorbent, the effect of operational parameters including pH, adsorbent dosage, contact time and Cr (III, VI) concentration were studied according to one-factor-at-a-time procedure. Obtained results revealed that selected material exhibited higher adsorption efficacy of trivalent chromium in alkaline solution (pH = 6-9) while adsorption of hexavalent chromium was best performed in strong acidic solution (pH = 1-2). The maximum removal efficacy of tri and hexavalent chromium ions (>93%) was achieved after 180 and 30 minutes of contact time, respectively, for the adsorbent dosage of 0.05 g/L and initial chromium concentration of 20 mg/L. The adsorption isotherms were better described by the Freundlich equation for both tri and hexavalent chromium ions (R^2 = 0.934 and R^2 = 0.995, respectively). Adsorption of trivalent and hexavalent chromium ions onto selected material followed the pseudo second order model (R^2 = 0.996 and R^2=0.991). Hence, the residual materials derived from the enrichment processes of quartz sand can be used as adsorbent for the removal of tri and hexavalent chromium ions from aqueous solutions.

References

[1] Allen SJ, McKay G, Khadar KYH (1989) Kinetics and equilibrium study of chromium adsorption on zeolite. Environ Pollut 56:39–50
[2] Mandal S, Mahapatra SS, Patel RK (2015) Neuro fuzzy approach for arsenic (III) and chromium (VI) removal from water. J. Water Process Eng 5:58–75
[3] Malamis, S. & Katsou, F. (2013). A review on zinc and nickel adsorption on natural and modified zeolite, bentonite and vermiculite. *J. Hazard. Mater.* 252–253, 428–461. DOI: 10.1016/j.jhazmat.2013.03.024.

Figures

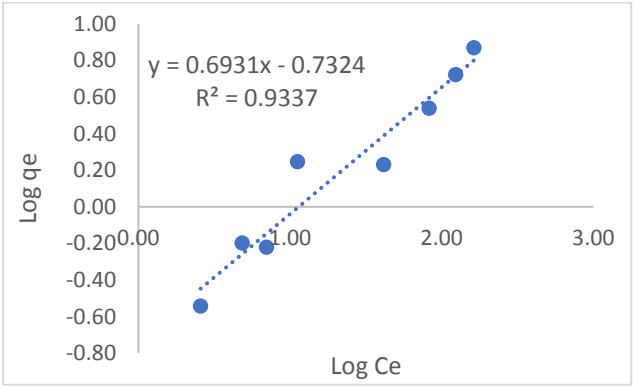

Figure 1. Freundlih adsorption isotherm for Cr (III) ions.

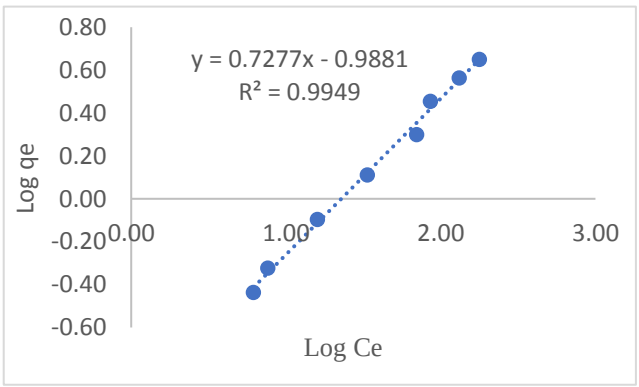

Figure 2. Freundlih adsorption isotherm for Cr (VI) ions.