

Ali Behnamfard

Ph.D. Mineral Processing Engineering



Professional Contacts

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Personal Data

E-mail behnamfard.ali@gmail.com
Nationality Iranian.
Date of Birth July 14, 1984.
Place of Birth Birjand, Iran.
Marital Status Married.

Education

- Sep. 2009- Feb. 2014 **Doctor of Philosophy (Ph.D.)** in "Mineral Processing", *Department of Mining & Metallurgical Engineering*, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran
- Dissertation Title Modeling of xanthate sorption onto activated carbon and its effect on zinc (II) ion removal
- Description Xanthates (dithiocarbonate) are one of the anionic surfactants which mainly used in the flotation of sulfide ores. For processing of more than 2 billion tons of sulfide ore, annually more than 200 thousand tons xanthates are used. The presence of residual xanthates in the wastewater of flotation plants is causes of serious environmental problems. Among different technologies for treating wastewaters, adsorption onto activated carbon (AC) is one of the best methods, because AC has a great affinity for sorption of organic compounds. In first part of my dissertation, we tried to find the ability and mechanism of xanthate adsorption onto AC.
Although AC has a great affinity for sorption of organic compounds but its capability for removal of the cationic heavy metals is low (i.e., less than 5 mg/g). Several methods for AC surface modification have been proposed to enhance this capability. One of them is the pre-loading of anionic surfactants onto AC. This creates new sorption sites on AC surface which enhances cation exchange capacity. The aim of second part of my dissertation was to investigate the effect of xanthate pre-loading on the AC ability for adsorption of Zn^{+2} ions.
- Dec 2012- Jun 2013 **Sabbatical period**, *Department of Industrial engineering and Information and Economics*, University of L'Aquila, Italy.
- Oct 2006-Feb 2009 **Master of Science (M.Sc.)** in "Mineral Processing", *Department of Mining & Metallurgical Engineering*, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran.
- Project title Identification of types and factors which causing *Carbon Fouling* in the sulfide circuit of *Mouteh Gold Processing Plant* and its reduction methods
- Oct 2002-Sep 2006 **Bachelor of Science (B.Sc.)** in "Mine Exploration Engineering", *Faculty of Engineering*, University of Birjand.

Industry Experience

- Dec 2012- Jun 2013 Laboratory of Hydro- and Biohydro-Metallurgical Engineering, Department of Industrial engineering and Information and Economics, University of L'Aquila, Italy.
- Description A novel hydrometallurgical process was proposed for selective recovery of Cu, Ag, Au and Pd from waste printed circuit boards (PCBs). More than 99% of copper content was dissolved by using two consecutive sulfuric acid leaching steps in the presence of H₂O₂ as oxidizing agents. The solid residue of 2nd leaching step was treated by acidic thiourea in the presence of ferric iron as oxidizing agent and 86% Au and 71% Ag dissolution was achieved. The precipitation of Au and Ag from acidic thiourea leachate was investigated by using different amounts of sodium borohydride (SBH) as a reducing agent. The leaching of Pd and remained gold from the solid residue of 3rd leaching step was performed in NaClO-HCl-H₂O₂ leaching system and the effect of different parameters was investigated. The best conditions for leaching of Pd and Au in NaClO-HCl-H₂O₂ leaching system were determined to be 5 M HCl, 1 V% H₂O₂, 10 V% NaClO at 336 K for 3 h with a solid/liquid ratio of 1/10. 100% of Pd and Au of what was in the chloride leachate were precipitated by using 2 g/L SBH. Finally, a process flow sheet for the recovery of Cu, Ag, Au and Pd from PCB was proposed.
- Oct 2006-Feb 2009 *Mouteh* Gold Processing Plant, Isfahan Province, Iran
- Description In *Mouteh* Gold processing plant, gold bearing ore after crushing and grinding to 80% less than 63µm is directly transferred to the flotation circuit and dosed with various flotation reagents. The flotation concentrate after ultrafine grinding to less than 20µm is recombined with the flotation tailing and proceed to the CIL circuit. *Organic carbon fouling* occurred in *Mouteh* CIL circuit due to the existence of flotation reagents at high concentrations in the leach pulp. The organic carbon fouling defines as the adsorption or accumulation of unwanted organic species on the surface or within the pores of activated carbon which reduces the gold sorption kinetics and hence causes great concern in the gold processing plants. This problem was solved during my M.Sc. thesis.
- Dec 2011- Jun 2012 National Iranian Copper Industries Co., Iran.
- Description The optimum conditions for selective leaching and precipitation of copper, gold and silver from anode slime was proposed and a process flow sheet for selective recovery of these metals was designed.
- Dec 2009- Apr 2011 Khatam al-Anbia Headquarter, Tehran, Iran.
- Description Several techniques for melting of copper sulfide concentrate and producing copper metal proposed by different companies. In this project we investigated the benefits and drawbacks of these methods.

Publications

Journal

Ali Behnamfard, M.M. Salarirad. Equilibrium and kinetic studies on free cyanide adsorption from aqueous solution by activated carbon. *Journal of Hazardous Materials* 170 (2009) 127–133.

<http://www.sciencedirect.com/science/article/pii/S0304389409007080>

Ali Behnamfard, M.M. Salarirad. Modeling of adsorption kinetics of cyanide by activated carbon from solution by using of kinetic models and adaptive neuro-fuzzy inference system. *Asian Journal of Chemistry* 22-1 (2010) 271-282. http://www.asianjournalofchemistry.co.in/User/ViewFreeArticle.aspx?ArticleID=22_1_38

M.M. Salarirad, **Ali Behnamfard**. The effect of flotation reagents on cyanidation, loading capacity and sorption kinetics of gold onto activated carbon. *Hydrometallurgy* 105 (2010) 47-53.

<http://www.sciencedirect.com/science/article/pii/S0304386X10002082>

M.M. Salarirad, **Ali Behnamfard**. Fouling effect of different flotation and dewatering reagents on activated carbon and sorption kinetics of gold. *Hydrometallurgy* 109 (2011) 23–28.

<http://www.sciencedirect.com/science/article/pii/S0304386X11001149>

Ali Behnamfard, M.M. Salarirad, F. Veglio. Process development for recovery of copper and precious metals from waste printed circuit boards with emphasize on palladium and gold leaching and precipitation. *Waste Management* 33 (2013) 2354–2363.

<http://www.sciencedirect.com/science/article/pii/S0956053X13003450>

H.K. Haghighi, D. Moradkhani, B. Sedaghat, M.R. Najafabadi, **Ali Behnamfard**. Production of copper cathode from oxidized copper ores by acidic leaching and two-step precipitation followed by electrowinning. *Hydrometallurgy* 133 (2013) 111–117.

<http://www.sciencedirect.com/science/article/pii/S0304386X12002708>

Behnamfard, A., & Salarirad, M. M. (2014). Characterization of coconut shell-based activated carbon and its application in the removal of Zn (II) from its aqueous solution by adsorption. *Desalination and Water Treatment*, 52(37-39), 7180-7195. <http://www.tandfonline.com/doi/pdf/10.1080/19443994.2013.822323>

Behnamfard, A., Salarirad, M. M., & Vegliò, F. (2014). Removal of Zn (II) ions from aqueous solutions by ethyl xanthate impregnated activated carbons. *Hydrometallurgy*, 144, 39-53.

<http://www.sciencedirect.com/science/article/pii/S0304386X14000024>

Arabyarmohammadi, H., Salarirad, M. M., & **Behnamfard, A.** (2014). Characterization and utilization of clay-based construction and demolition wastes as adsorbents for zinc (II) removal from aqueous solutions: an equilibrium and kinetic study. *Environmental Progress & Sustainable Energy*, 33(3), 777-789. <http://onlinelibrary.wiley.com/doi/10.1002/ep.11833/pdf>

Behnamfard, A., & Khaphaje, E. (2019). Beneficiation of a low-grade iron ore by combination of wet low-intensity magnetic separation and reverse flotation methods. *Journal of Mining and Environment*, 10(1), 197-212.

http://jme.shahroodut.ac.ir/article_1354_4cb13a6db3e716b138e0382a296473ee.pdf

Publications (continue)

Ghasemi, S., **Behnamfard, A.**, & Arjmand, R. (2019). Reprocessing of Sangan iron ore tailings by flotation. *Journal of Mining and Environment*. Article in press.

http://jme.shahroodut.ac.ir/article_1450.html

Behnamfard, A., Alaei, R., Chegini, K., & Veglio, F. (2019). Removal of free cyanide from aqueous solutions by pine cone scale (PCS). *Desalination and Water Treatment*, 153, 121-129.

http://www.deswater.com/DWT_abstracts/vol_153/153_2019_121.pdf

Behnamfard, A., & Khaphaje, E. (2019). Characterization of Sangan low-grade iron ore and its processing by dry low-intensity magnetic separation. *International Journal of Mining and Geo-Engineering*. Article in press.

https://ijmge.ut.ac.ir/article_71669_4678495ca73a8ea7f6686bde206b64b0.pdf

Behnamfard, A., & Alaei, R. (2017). Estimation of coal proximate analysis factors and calorific value by multivariable regression method and adaptive neuro-fuzzy inference system (ANFIS). *International Journal of Mining and Geo-Engineering*, 51(1), 29-35.

https://ijmge.ut.ac.ir/article_62150_a18462f04f3157425bf2edd881a28c6d.pdf

Behnamfard, A., Chegini, K., Alaei, R., Veglio, F. (2019). The effect of thermal and acid-treatment of kaolin on its ability for cyanide removal from aqueous solutions, *Environmental Earth Sciences*, Article in press.

Teaching Experience

2013-present

M.Sc. Courses: Advanced Hydrometallurgy, Mineral processing and the environment, Methods of concentration and purification of leach liquors, Basic design of mineral processing plants, Design of Experiments

2013-present

B.Sc. Courses: Hydrometallurgy, Flotation, Coal Washing, Processing of industrial minerals, Processing of metal minerals

2009-2013

Guest Lecture: Hydrometallurgy course for M.Sc. students of Amirkabir University of Technology (Tehran Polytechnic). I presented a lecture for this course. Activated carbon: Introduce, preparation methods, characterize and industrial applications

2009-2013

Teaching Assistant: Flotation course for B.Sc. and M.Sc. students, Amirkabir University of Technology (Tehran Polytechnic).

2009-2013

Tutorial Assistant: Supervision support for several M.Sc. and B.Sc. projects

Honors

2015	Top staff of University of Birjand.
2006	First honor among undergraduate students of mine exploration engineering, University of Birjand.
2009	First honor among M.Sc. students of mineral processing engineering, Amirkabir University of Technology (Tehran Polytechnic).
2010	Member of Iran's National Elites Foundation
2013	Outstanding Ph.D. candidate of Mining & Metallurgical Department, Amirkabir University of Technology (Tehran Polytechnic).

Professional Qualifications

Characterization	X-ray Fluorescence (XRF), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX), Brunauer-Emmett-Teller (BET) for determination of total surface area and pore size distribution of adsorbent, Determination of point of zero charge (PZC), Surface functional groups characterization (Boehm titration, Elemental Analysis, ...).
Analysis of organic and inorganic compounds in aqueous solutions	Atomic Absorption Spectrometer, UV-Visible Spectrometer, titration (titration of cyanide using silver nitrate, titration of zinc (II) ion with EDTA at very low concentrations, etc.), High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Gold analyses (DIBK/Aliquat 336 and MIBK solvent extraction).
Preparation of ore sample	Crushing, grinding and sieve analysis.
Flotation	Flotation of ore minerals.
Leaching	Cyanidation of gold bearing ores, Selective leaching of metals from different primary or secondary sources.
Precipitation	Selective precipitation of metal cations or complexes from leach liquors or wastewaters.
Adsorption	Adsorption removal of different organic and inorganic compounds from aqueous solutions by using different adsorbents.
Modeling of Kinetic & equilibrium data	Modeling of kinetic and equilibrium data by using Linear and non-linear regression methods and also analysis of error functions.
Thermodynamic studies	Determination of thermodynamic parameters and energy of activation of different leaching and adsorption processes.