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## Selective removal of copper and nickel ions from acid mine drainage

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Acid mine drainage (AMD) is one of the most prevalent environmental problems all over the world. AMD is resulting from the microbial oxidation of pyrite and other sulfide ores in presence of water. AMD is toxic to water organisms not only because of its acidity, but it also solubilizes toxic metals such as cadmium, cobalt, chromium, copper, nickel and lead. We explored the selective removal of toxic metal (Cu, Ni) ions present in AMD from the excess of ferrous ions of using a chelating resin with a di-(2-picolyl)amine functional group (Lewatit TP 220) and possibility of subsequent recovery of metallic copper with electro-winning. Simulated AMD solution contained 2 g/L of iron together with manganese, zinc and copper or nickel ions. Metals were added as sulfates and pH was adjusted to 2 using sulfuric acid. Column dynamic experiments were used to determine sorption and desorption efficiency of Cu and Ni ions. The chelating resin TP 220 demonstrated a very high affinity for copper, while manganese, zinc and iron were not taken up during the experiments. Experiments related to the removal of nickel from the same AMD matrix, showed that the sorption of nickel was less efficient than that of copper. During the experiments, small quantity of iron in the form of hydrated ferric oxide flakes formed a layer on the surface of the column. For that reason two-stage desorption using sulfuric acid in the first step and ammonia solution in the second step was used. Unlike the Dowex XFS 43084 which was used in our previous work and is not produced anymore, Lewatit TP 220 (analogue of Dowex XFS 4195), can not be regenerated directly with sulfuric acid. The necessity to strip copper from the loaded resin by complexation reaction with ammonia solution is the main drawback of the resin. The resulting ammonia solution of copper is not suitable electro-winning of Cu. Therefore, weak base anion exchanger having tetraethylenepentamine (TEPA) functional group on macroporous polyacrylate matrix Purolite A 832 was used to as chelating resin to take up copper from ammonia solution. After stripping copper with sulphuric acid, it can be recovered by electrolysis.

### Biography

Yelena Gordyatskaya is a PhD student at Department of Power Engineering of University of Chemistry and Technology in Prague and belongs to the group "Water treatment by ion exchange and membrane technologies". Since her Master's study, which was focused on determination of the efficiency of sorption of organic pollutants from water by batch equilibrium experiments and dynamic column experiments, she has been fully acquainted with ion-exchange water treatment technologies. She is now working on selective sorption and recovery of metals from industrial wastewaters. In the scope of PhD course, she attended the Summer School in Dresden: Bio-Leaching and Metal Extraction Processes for Urban Mining: From Fundamental Principles to Practical Applications, 2016.

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