Removal of sulphate from cold mining waters

Chemical Process Engineering, University of Oulu

Research objectives

- Development of novel biosorbents for sulphate removal
- Regeneration of used biosorbents
- Simultaneous biological sulphate reduction and metal ions recovery as metal sulphides
- Utilisation of organic wastes as carbon sources for sulphate reducing consortium

Results

- High sulphate sorption capacity of 189.5 ± 2.7 mg/g under acidic conditions with aminated peat.

Aminated peat biosorbent developed for sulphate sorption.

- Enriched sulphate reducing bacterial consortium able to reduce sulphate at 6° C with succinate as a carbon source.

Before inoculation | After inoculation | After one week of cultivation at 6 °C | After two weeks of cultivation at 6 °C

Biological sulphate reduction is observed by the formation of black iron sulfide in synthetic mining water.

Publications

- Gogoi H, Leiviskä T, Rämö J & Tanskanen J. (2019) Production of aminated peat from branched polyethylenimine and glycidyltrimethylammonium chloride for sulphate removal from mining water. Environmental Research 175: 323-334.
- Virpiranta H, Taskila S, Leiviskä T, Rämö J & Tanskanen J. (2019) Development of a process for microbial sulfate reduction in cold mining waters – Cold acclimation of bacterial consortia from an Arctic mining district. Environmental Pollution 252: 281-288.

Projects

COSUMA – Comprehensive Sulfate Management in Cold Mining Waters
- 9/2016 - 8/2020
- Funded by the Academy of Finland

SEESIMA – Supporting Environmental, Economic and Social Impacts of Mining Activity
- 10/2018 - 9/2021
- Funded by the Kolarctic CBC Programme

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