EBNet BIV2021 Summary Sheet – Funded Projects

BIV202101

Professor Sebastien Farnaud, Coventry University / Advanced Alloy Services Ltd.

Bioleaching application for the recovery of Minor and Rare Earth Metals from Complex Nickel Alloys Dust

Public Summary

This project is a collaboration between Advanced Alloys Services (AAS) Ltd and the Bioleaching Research Group (BRG) from Coventry University (CU).

This proposal's aim is to develop bioleaching-based sustainable processes to recover metals from metric tons of dust, which are generated from the process of abrasive wheel-cutting of superalloys at AAS. In this project, which involves the selective recovery of metals using microorganisms, the objectives are environmental and economic, as the project will reduce waste, while providing the company with another source of income from the sale of the recovered specific valuable metals.

AAS Ltd prepares, refines and supplies high purity metals and fully processed and certified superalloy reverts to customers all over the world. During the processes of cutting complex Nickel-based superalloy cast-stick bars, several metric tons of dust are generated and collected each month. This superalloys dust contains valuable and rare elements, such as Ta, Re, Co, Cr, Mo, W, Hf as well as Nickel. Although some of the dust is currently processed to recover Re and other elements in a processing plant in Canada, the rest of the dust is sold at low value for its Nickel content into the stainless-steel industry, where the other valuable elements are lost forever.

As current recycling processes, which include pyrometallurgy and hydrometallurgy, have high operation costs and energy-consumption associated with low specificity and negative impacts on the environment, the development of sustainable approaches is essential. Among these new approaches, bioleaching, which uses microorganisms to recover metals, has been shown by us and others, to be environmentally and economically sustainable, and a greener alternative than conventional techniques.

The bioleaching-based methodologies developed in this project, in combination with the recovery of solubilised metals using electro-chemical methods, will result in closed-loop systems in agreement with the principles of the circular economy and the UN Sustainable Development Goals.

This is a partnership between AAS ltd and CU, with a cross-institute collaboration, which brings together expertise in microbiology from the Institute of Health and Wellbeing, and expertise in electro-chemistry from and the Institute for Future Transport and Cities.

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Dr Yue Zhang, University of Southampton / Triton Electronics Ltd.

Sludge dewaterability: improved tools for the emerging biotech industries

Public Summary

Processing of wastewater biosolids is a major issue for the water industry, typically accounting for half the cost of wastewater treatment. This is due to both the nature and the volume of the material: sludges are complex biological substances capable of holding large amounts of water via different mechanisms. Separation of liquids and concentration of the solid fraction can have very significant benefits both on transport costs and impacts, and on the organic loading rates that can be applied to digestion plant and infrastructure. The Capillary Suction Time (CST) is one key parameter used to assess sludge dewaterability.

Triton Electronics has been the market leader on CST apparatus for 25 years and has recently carried out work to update its design. The company wishes to test the performance of the modified equipment, comparing it with the original and identifying any new capabilities. It also believes that current rapid moves towards a more circular bioeconomy offer new market opportunities, through the introduction of new feedstocks such as food and agro-wastes, and of new treatments including low-temperature anaerobic processes and biorefinery fermentations. The resulting sludges and digestates will have very different properties from the familiar waste activated sludge and may require different testing protocols. The company therefore wishes to commission preliminary trials to explore the capability of its new system with some of these materials, where possible linking the results to other physico-chemical and biological parameters to provide an enhanced understanding of factors affecting sludge dewaterability in tests and future real-world applications.

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