Biotechnology and Biological Sciences Research Council

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EBNet Travel Bursary Support
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EBNet Environmental Biotechnology

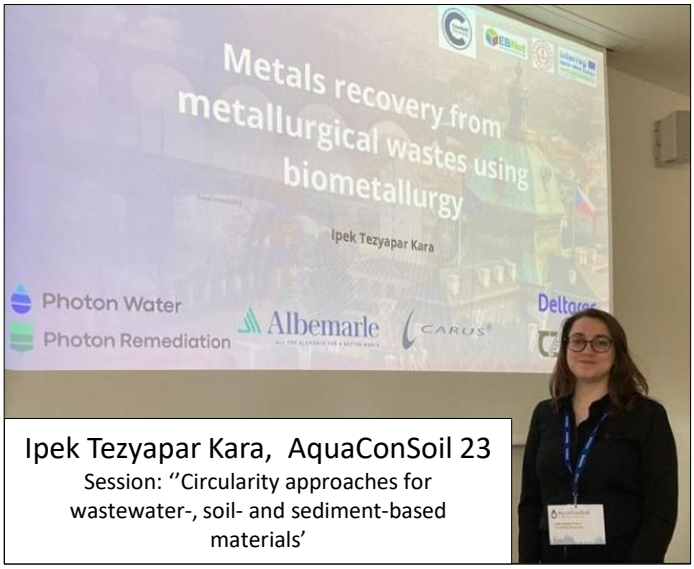
AquaConSoil, 11-15 September 2023, Prague

Presentation title:
'Metals recovery from metallurgical wastes using biometallurgy'
Authors: Ipek Tezyapar Kara *et al.*

Ipek received her bachelor's degree in Environmental Engineering from Kocaeli University, Turkey in 2016. She completed her M.Sc. degree at the same university in 2019. Ipek started her PhD research at Cranfield University Water Science Institute.

Her focus is metal recovery from metal-bearing wastes by biohydrometallurgy. She is currently interested in metal recovery from metallurgical by-products.

AquaConSoil is a bi-yearly event where scientists, policy & decision makers, and industry representatives gather to learn, share, and engage on sustainable use and management of soil, sediment and water resources.



Ipek Tezyapar Kara, AquaConSoil 23
Session: ''Circularity approaches for wastewater-, soil- and sediment-based materials'

Main presentation findings:

In this study, the potential of bioleaching to extract valuable metals from industrial by-products, specifically basic oxygen steelmaking dust (BOS-D) and goethite was investigated.

These materials are typically discarded due to their high zinc content and lack of efficient regeneration processes. By using Acidithiobacillus ferrooxidans, successful bioleaching of various metals, including heavy metals, critical metals, and rare earth elements was achieved.

The Taguchi orthogonal array design was used to optimise the bioleaching process, considering four variables at three different levels. After 14 days, the highest metal extraction for the BOS-D (11.2 mg Zn/g, 3.2 mg Mn/g, 1.6 mg Al/g, 0.0013 mg Y/g, and 0.0026 mg Ce/g) was achieved at 1% solid concentration, 1% energy source concentration, 1% inoculum concentration, and pH 1.5.

For goethite, the optimal conditions were 1% solid concentration, 4% energy source concentration, 10% inoculum concentration, and pH 2 resulting in an extraction of 26.6 mg Zn/g, 2.1 mg/g Mn, 1.8 mg Al/g, 0.01 mg Co/g, 0.0022 mg Y/g.

These findings are significant, as they demonstrate the potential to extract valuable metals from previously discarded industrial by-products. The extraction of such metals can have substantial economic and environmental implications, while simultaneously reducing waste in the metallurgical industry. Furthermore, the preservation of initial concentration of iron in both BOS-D and goethite residues represents a significant step towards implementing more sustainable industrial practices.