

## **Biomining '23**

**Title:** Pilot-scale demonstrations of innovative biohydrometallurgy for sustainable valorisation of mining waste: main outcomes from H2020-NEMO project

**Authors:** Anne-Gwénaëlle Guezennec<sup>1,\*</sup>, Agathe Hubau<sup>1</sup>, Douglas Pino-Herrera<sup>1</sup>, Ville Heikkinen<sup>3</sup>, Dave Dew<sup>4</sup>, Carmen Falagan<sup>4</sup>, Karen Hudson-Edwards<sup>4</sup>, Mohammad Khoshkhoo<sup>2</sup>, Anders Sand<sup>2</sup>, Jarno Makinen<sup>5</sup>

(1) BRGM - 3, Avenue Claude Guillemin – BP36009 – 45060 Orléans CEDEX 2 – France

(2) Boliden Mineral AB – Finnforsvägen 4, SE-936 81 Boliden, Sweden

(3) Terrafame Ltd. – Malmitie 66, 88120 Tuhkakylä – Finland

(4) University of Exeter - Environment & Sustainability Institute, Camborne School of Mines, Penryn, Cornwall TR10 9FE, UK

(5) VTT - Technical Research Centre of Finland Ltd., Visiokatu 4, 33101 Tampere, Finland

\* Corresponding author

### **Abstract:**

In the frame of the European project H2020-NEMO (Near-zero-waste recycling of low-grade sulphidic mining waste for critical-metal, mineral and construction raw-material production in a circular economy), (bio)hydrometallurgical processing routes were developed to remove sulphides from tailings while residual valuable metals and minerals were recovered. Two case-studies were considered: low-S tailings from Sotkamo mine and high-S tailings from Luikonlahti mine. The core technology was the heap bioleaching for Sotkamo and bioleaching in stirred tank reactors for Luikonlahti, and both of them were compared to the pond bioleaching option. Several downstream processes were then applied to the bioleachate for the recovery and separation of Zn, Ni, Cu, Co, REE, Mn, K and Mg. All the (bio)hydrometallurgical processes developed within NEMO were demonstrated up to TRL 7-8 in various pilot scales, which provides a relevant technological portfolio for tailings valorization and reduction of long-term environmental impacts.