

Electrochemical Demolition: a green and sustainable recovery process for hardmetal scrap

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Recycling of Critical Raw Materials (CRMs) / Strategic Raw Materials (SRMs) such as tungsten and cobalt is mandatory for the European industrial economy. Electrochemical methods to recover those metals from hardmetal scrap, although widely studied, never reached the productivity level of common industrial processes. In recently published work [1,2], we demonstrated – at laboratory scale – an innovative and eco-friendly electrochemical recovery process - that is the object of a recent MESCEL EIT-Raw Materials funded project - to circumvent hardmetal pseudopassivation with alloy-bounded corrosion-resistant grades. As verifying the validity of the protocol in non-laboratory conditions is important to fully assess its potential for industrial applications, in this work the protocol is applied with a realistic electrochemical cell configuration, extending the approach from dedicated laboratory samples to objects that mimic real-life scrap, including edges and irregular surface variations. The results show that productivity increases, although the presence of edges introduces mechanical instability in the surface rejuvenation process and uneven current density lines distribution, preventing uniform material extraction across the entire surface. These results highlight the protocol validity and lay the foundation for further optimization towards pilot plant implementation.

[1] F. Tavola, G.P. De Gaudenzi, G. Bidinotto, F. Casamichiela, A. Pola, S. Tedeschi and B. Bozzini. *ChemSusChem*, **2025**, e202402218

[2] B. Bozzini, M. Amati, L. Gregoratti, M. Kazemian Abyaneh, F. Tavola, S. Tedeschi, G. P. De Gaudenzi. *Int. J. Refr. Met. Hard Mater.*, **2024**, 118, 106479