

Radiological assessment of novel bauxite residue valorization methods

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Abstract

Reliable and unrestricted access of the European Union (EU) to raw materials as well as reduction of the EU dependence on primary raw materials have been outlined [1], [2] as pillars for the future raw materials strategy. Additionally, the current EU waste management directive [3] sets obligations to concerned parties to handle wastes in a way that prevents negative effects on humans and environment. The aforementioned strategies have increased interest toward the reuse of mining tailings and metallurgical by-products. Processing of these residues provides additional societal benefits apart from being a source for resources such as reduction of landfill sites and nature retention. These materials often have radionuclide concentrations marginally higher than found in more conventionally used raw materials, which can be further increased by valorizing activities. Bauxite residue (BR), produced in the orders of megatons annually worldwide [4], is a by-product of the aluminium industry and is an example of such residues. The increased interest towards valorization of this industrial by-product has led to the development of novel methods, to utilize this material in the construction industry or to use it as a raw resource for metal production. The current work provides an assessment of novel BR valorization methods from the radiological perspective and offers recommendations for their further application, considering recovery of iron, aluminium and other metals. The application of BR in the construction industry in bulk quantities is limited by the infrastructural uses due to radioactivity content and EU safety standards for ionizing radiation [5], and this work characterizes constraints and outlines the possibilities for this increased utilisation of BR in various areas.

References

- [1] European Commission, "The raw materials initiative — meeting our critical needs for growth and jobs in Europe," *Commun. from Com. to Eur. Parliam. Council*, p. 13, 2008.
- [2] European Commission, "Commission staff working document on the implementation of the Raw Materials Initiative," p. 15, 2014.
- [3] "DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on waste and repealing certain Directives," *Off. J. Eur. Union*, pp. 3–30, 2008.
- [4] K. Evans, "The History, Challenges, and New Developments in the Management and Use of Bauxite Residue", *J. Sustain. Metall.*, 2016, in press, doi:10.1007/s40831-016-0060-x.
- [5] European Parliament, "Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom a," *Off J Eur Commun L13*, no. December 2003, pp. 1–73, 2014.