Towards sustainable mineral and metal industry: ZERO Bauxite Residue and ZERO CO2 from co-production of Alumina, Silica and precipitated Calcium carbonate by the Aranda-Mastin technology

Rendicontazione

Informazioni relative al progetto

AlSiCal

ID dell'accordo di sovvenzione: 820911

Sito web del progetto

DOI
10.3030/820911

Progetto chiuso

Data della firma CE
6 Maggio 2019

Data di avvio
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29 Febbraio 2024

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SOCIETAL CHALLENGES - Climate action, Environment, Resource Efficiency and Raw Materials

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€ 5 888 235,00

Coordinato da
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Questo progetto è apparso in...

19 Novembre 2024

Periodic Reporting for period 3 - AlSiCal (Towards sustainable mineral and metal industry: ZERO Bauxite Residue and ZERO CO2 from co-production of Alumina, Silica and precipitated Calcium carbonate by the Aranda-Mastin technology)

Periodo di rendicontazione: 2022-09-01 al 2024-02-29

Sintesi del contesto e degli obiettivi generali del progetto

AlSiCal has developed and de-risked a new groundbreaking technology to co-produce three essential raw materials (alumina, silica and precipitated calcium carbonate), using new resources - e.g. anorthosite, abundantly available worldwide - whilst generating ZERO Bauxite Residue and with negative-to-zero CO2 emissions. The current production of those raw materials generate considerable CO2 emissions, and bauxite residue in the case of alumina production from bauxite by the Bayer process. With the AlSiCal technology, these emissions will be avoided. Importantly, the technology allows the exploitation of new resources, found in large amounts in Europe. Therefore, it can reduce largely the imports dependency on raw materials for aluminium production in Europe.
The AlSiCal-IFE technology provides:
• Green co-production of 3 essential raw materials, in a single process and from one source, with advantageous environmental, social and economic results
• Highly efficient use of anorthosite, a mineral abundant in Europe and worldwide
• Integrated CO2 use (and capture alternative for locations with no access to CO2-free energy) for negative or zero CO2 emissions from production.
• Zero Bauxite Residue from alumina production.

Lavoro eseguito dall'inizio del progetto fino alla fine del periodo coperto dalla relazione e principali risultati finora ottenuti

From the project´s formal point of view, the Consortium has successfully fulfilled all - and beyond - the scope, expected results and impact foreseen in the project proposal and committed in the Grant

Agreement.
The main technological objective has been achieved; i.e. to develop a technology to process non-bauxitic resources into alumina and other co-products with integrated CO2 use and improved environmental and social performance compared to state-of-the-art technologies. In fact, two new process alternatives have been developed and optimized, with positive technical, economic, social and environmental feasibility.

The feasibility studies have revealed that the AlSiCal-IFE v2 process (and, at lower development maturity, potentially also the AlSiCal-AVLabs process) shows promising economic prospects. Furthermore, the social and environmental assessments indicate very advantageous performance compared to state-of-the art technologies producing the same products from conventional sources (bauxite, limestone and others). The process has been dimensioned and optimized for realistic, marketable processing capacity and feedstock consumption. These very positive results denote the enormous opportunity of the AlSiCal technology to significantly impact the mineral industry, and become an innovative step towards a more socially and environmentally sustainable future.

The pathway of establishing an alternative technology based on anorthosite for aluminium production - instead of the current processing of bauxite - offers a precious opportunity to rethink the complex interplay of economic, cultural and community dynamics of this industry. To maximize positive - and minimize negative - social impacts, it is essential to engage with impacted communities, to prioritize social equity, and to implement sustainable practices in the transition process.

Due to the large extension of results, exploitation and communication plans, here are the key documents describing those:
- Communication and Dissemination plan of the project is described in Deliverable D7.5 (D7.3c) Updated Communication and Dissemination Plan.
- Project results and their exploitation and dissemination plan is described in Deliverable D7.11 (7.5b) Updated exploitation business plan. AlSiCal.
- Finally, the project work summaries and conclusions for all the activities is compiled in Deliverable D6.6 Global Report. This final report is the master document of the project, which refers also in each section to all the other related documentation generated during the project, for consultation of detailed if necessary.

Progressi oltre lo stato dell’arte e potenziale impatto previsto (incluso l’impatto socioeconomico e le implicazioni sociali più ampie del progetto fino ad ora)

AlSiCal aims to revolutionize the industrial minerals sector by implementing a zero-waste and negative-to-zero CO2 emissions process that transforms anorthosite rock into valuable mineral products - alumina, silica, PCC alternatively CaO or wollastonite.
The idea of producing alumina and other products from non-bauxitic resources has been pursued in the past (largely during the 1970s´and 1980s´). Unfortunately the processes proposed at those times were not economically feasible or advantageous enough in key sustainability areas as to be fully

developed and industrialized.
The AlSiCal proposal was initiated in late 2017, considering all the learnings from former attempts, unsolved challenges and gaps, and targeting innovative improvements to, finally, make it a realistic, up-scalable process. After signature of the Grant Agreement, AlSiCal´s kick off meeting was held in September 2019, setting a very good start for the project.
AlSiCal has invented, de-risked and develop (from TRL 2 to TRL 4-5) the AlSiCal technology under sustainability and efficiency principles. It has assessed and quantified the techno-economic feasibility, potential value creation for Europe, Life Cycle Analysis, impact and risks of this technology upon the key sustainability pillars: economy, society and environment. The achievements of the project are of great quality and potential impact: the AlSiCal project is acknowledged by all Consortium partners, external stakeholders and interested actors as “one of a kind” RIA-H2020 project, due to the large scope and the many innovations proposed and successfully developed, with special emphasis on the holistic approach of the work and the fruitful, interdisciplinary collaboration.

Socio-economic impact during the project implementation:
- AlSiCal has been performed by a balanced team of R&D and industrial partners representing the whole value chain, with remarkably good gender balance in all professional categories, especially considering how unbalanced is still the raw materials industry in general, and the scientific fields on focus in this project.
- Numerous jobs have been generated in the RTO teams for the implementation of the team, with the corresponding training of new experts.
- Targeted dissemination and communication actions have contributed to increased social and industrial engagement for developing innovative sustainable technologies for mineral processing.
Socio-economic impact expected from the project exploitation:
- The different partners have set a roadmap for exploitation of the project results.
- The new knowledge has became cutting-edge in hydrometallurgy and CO2 utilization innovation for more sustainable industry, to be used in spin-off projects and other value chains
- The AlSiCal technology has large potential to expand towards varied materials sources besides anorthosite.
- IFE has the will to pursue further upscaling and commercialization of the technology. Each AlSiCal plant for 1 Miotonne/year anorthosite input is expected to generate ca. 150 direct jobs and numerous indirect jobs.

AlSiCal has opened new avenues of innovation towards more sustainable raw materials industry, emphasizing the need - and great opportunity - to adapt or invent metallurgical processes into more sustainable ones, hopefully to become an industrial reality and have positive impact for generations to come.

International workshop organized by the Consortium, Brazil 2023

Project Consortium Delegates at the kick off meeting of AlSiCal (IFE, Kjeller. September 2019)

Consortium meeting in Greece, 2022

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