Innovative circular and sustainable process to advance the extraction of critical raw materials from seawater

SEArcularMINE, a €6 million Research and Innovation project funded under EU Horizon 2020, officially launched its activities, working towards developing leading technologies to ensure the sustainable supply of raw materials for key industrial value chains in Europe.

“We will prototype an innovative integrated process aimed at recovering energy and critical raw materials such as magnesium, lithium, rubidium and other trace elements from waste brines in Mediterranean basin saltworks,” explains Prof. Andrea Cipollina, project coordinator.

The team is composed of 12 partner organisations from universities, research institutes, SMEs and multinationals from Europe and the wider Mediterranean basin.

Led by the University of Palermo, Sicily, the project’s activities were initiated with a meeting on 24 June 2020 where the plans for the next four years were discussed.

Europe currently depends on imports of raw materials that are critical for economic development. The minerals targeted by SEArcularMINE are increasingly needed in a
range of high growth industrial sectors including advanced battery technology and plastics alongside pharmaceutical and medical applications. As the market leader, China supplies more than 85% of global magnesium demand*. SEArcularMINE will contribute towards lowering the dependency of Europe on imports, especially for the materials that have been classified by the European Commission as Critical Raw Materials (CRM).

“Harvesting minerals from the sea through sustainable approaches which are environmentally friendly and economically competitive is one of the most ambitious challenges and most promising options for alternative mining,” states Professor Giorgio Micale of University of Palermo.

Magnesium, a designated CRM, is one of the most abundant elements in seawater. Its extraction from seawater by industrial electrolysis was widely employed, but uneconomical production costs now make this technology uncompetitive. SEArcularMINE will use very concentrated seawater brine as its starting point to develop 3 core innovative technologies, with additional process innovations also expected. A working prototype and new visitor centre in the traditional saltworks of Trapani, Sicily will be created, advancing a 2,700 year old industry into the 21st Century with globally applicable technological innovation.

Environmental sustainability is a key pillar to the project, embracing the respect for nature of the traditional saltworks process. The project will target very low energy consumption, alongside using novel technology to generate electricity from salinity gradients of seawater. A critical aspect will be a circular approach to try eliminate the generation of waste streams. This circularity also avoids the use of any external inputs, maximising resource efficiency and economic viability.

The economic impacts could be far-reaching for coastal areas of South Europe and North Africa, where saltworks are performing under capacity or are abandoned. The team will also consider integration with desalination technologies which could potentially help mitigate the water scarcity crisis for local communities. SEArcularMINE’s circular process concept will utilise waste streams and current infrastructure, minimising environmental and physical impacts by design, whilst developing innovative, sustainable and cost-effective technologies that will contribute to securing European access to CRM.

More information coming soon: www.SEArcularMINE.eu
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