

Scientists have developed a new 'key-hole surgery' technique to extract metals from Earth

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Scientists have developed a new 'key-hole surgery' technique to extract metals from the Earth—which could revolutionize the future of metal

mining

A team of international researchers, including Dr. Rich Crane from the Camborne School of Mines, University of Exeter, have developed a new method to extract metals, such as copper, from their parent ore body.

The research team have provided a proof of concept for the application of an electric field to control the movement of an acid within a low permeability copper-bearing ore deposit to selectively dissolve and recover the [metal](#) in situ.

This is in contrast to the conventional approach for the mining of such deposits where the material must be physically excavated, which requires removal of both overburden and any impurities within the ore (known as gangue material).

The researchers believe the new technique has the potential to transform the mining industry, because it has the capability to dissolve metals from a wide range of ore deposits that were previously considered inaccessible.

Furthermore, due to the non-invasive nature of the extraction, the research team are hopeful that the study will help usher in a more sustainable future for the industry.

This is urgently required now in order to provide the plethora of metals required to deliver [green technology](#), such as renewable energy infrastructure and electrified vehicles, whilst limiting any potential environmental damage associated with the mining of such vitally important metals.

The study was recently published in *Science Advances*.

Dr. Rich Crane from the Camborne School of Mines, University of Exeter, and co-author of the study, said: "This new approach, analogous to "key-hole surgery", has the potential to provide a more sustainable future for the mining industry, by enabling the recovery of metals, such as copper, which are urgently needed for our global transition to a new Green Economy, whilst avoiding unwanted environmental disturbance and energy consumption."

The central principle behind most modern [mining](#) techniques has not fundamentally changed since their original conception, which marked the beginning of the Bronze Age: metals are recovered from the subsurface via physical excavation, i.e., the construction of tunnels to gain access to the deposits, or by creating "open cast" mines.

This technique demands large volumes of surface soil, overburden and gangue material to also be excavated, which can contain millions of tons of material—and can also lead to habitat destruction.

In this new publication, experts from the University of Western Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Technical University of Denmark and the University of Exeter, have demonstrated that a targeted electric field can be used to dissolve and then recover copper in situ from the ore—avoiding any requirement to physically excavate the material.

This new technology comprises the construction (drilling) of electrodes directly into an ore body. An electric current is then applied which can result in the transport of electrically charged metal ions, such as copper, through the rock via a process called electromigration.

The research team have now provided a Proof of Concept for this new technology at laboratory scale, which has also been verified using computer modeling. They are confident that the idea will work beyond

the laboratory-scale.

More information: Evelien Martens et al, Toward a more sustainable mining future with electrokinetic in situ leaching, *Science Advances* (2021). [DOI: 10.1126/sciadv.abf9971](https://doi.org/10.1126/sciadv.abf9971)

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