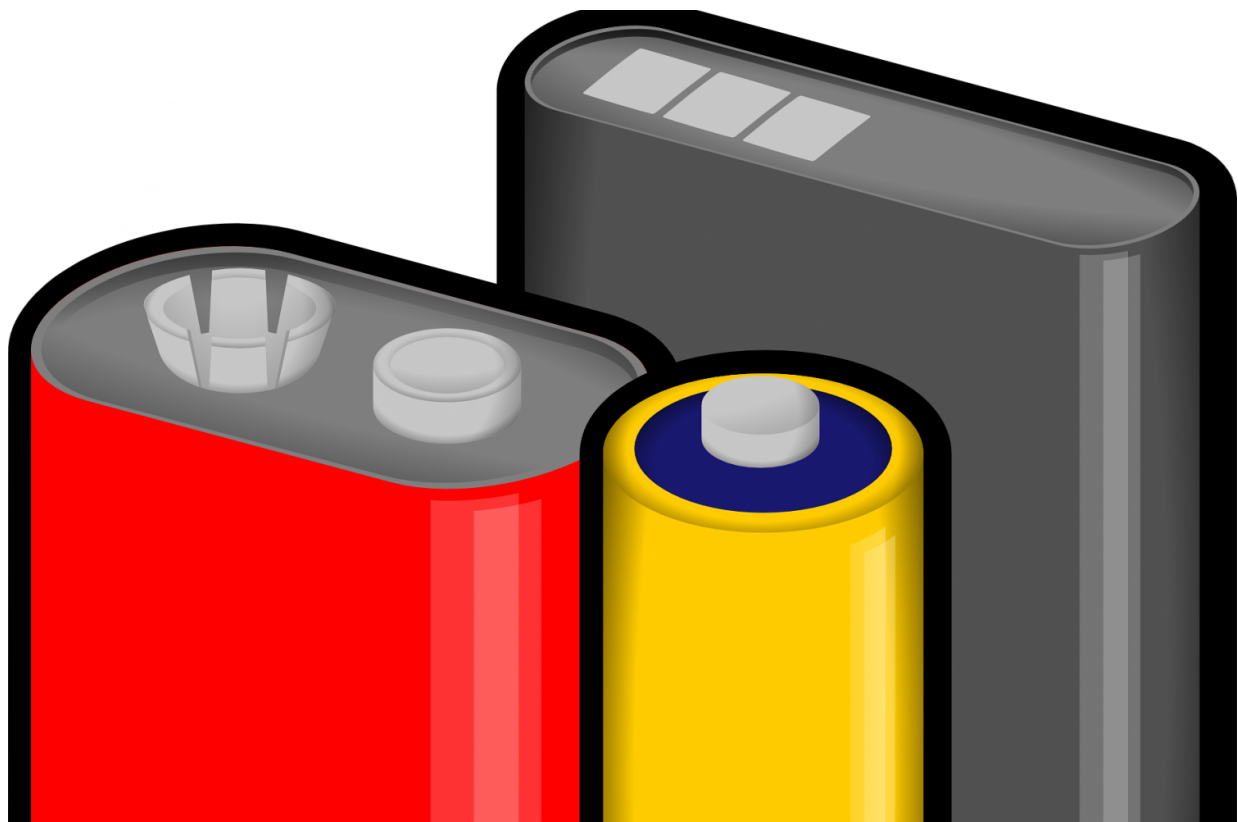


'Needle in a haystack' discovery in quest to unlock clean energy technology

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Researchers from the University of Aberdeen have discovered a new family of chemical compounds that could revolutionize fuel cell technology and help reduce global carbon emissions.

Described as the equivalent of discovering "a needle in a haystack," the [chemical compounds](#)—collectively known as a 'hexagonal perovskites'—could be the key to unlocking the potential of ceramic [fuel cells](#).

Ceramic fuel cells are highly efficient devices that convert [chemical energy](#) into [electrical energy](#) and produce very low emissions if powered by hydrogen, providing a clean alternative to fossil fuels.

Another advantage of ceramic fuel cells is that they can also use [hydrocarbon fuels](#) such as methane, meaning they can act as a 'bridging' technology which is an important asset in terms of the move away from hydrocarbons towards cleaner energy sources.

They can be used to power cars and homes but the high temperature of operation results in a short life span. Lowering the working temperature is essential for long-term operation, stability, safety and cost.

Scientists from the University of Aberdeen have been researching the potential for a new compound that might overcome these issues for a number of years, and the discovery of a new chemical compound—which exhibits high conductivity at [lower temperatures](#)—marks a major breakthrough.

The results of their research are revealed in a paper—"High oxide ion and proton conductivity in a disordered hexagonal perovskite," which is published today in the journal *Nature Materials*.

Professor Abbie McLaughlin, Director of Research in the University's Department of Chemistry, led the study.

She explained: "Ceramic fuel cells are highly efficient, but the problem is they operate at really high temperatures, above 800 °C. Because of

that they have a short lifespan and use expensive components.

"For a number of years we've been looking for compounds that might overcome these issues in the relatively unexplored hexagonal perovskite family, but there are specific chemical features required which are hard to find in combination. For example, you need a chemical compound with very little electronic conductivity which is stable in both the hydrogen and oxygen environments of the fuel cell.

"What we have discovered here is a dual proton and oxide ion conductor that will operate successfully at a lower temperature—around 500 °C—which solves these problems. You could say that we've found the needle in a haystack that can unlock the full potential of this technology."

More information: Sacha Fop et al. High oxide ion and proton conductivity in a disordered hexagonal perovskite, *Nature Materials* (2020). [DOI: 10.1038/s41563-020-0629-4](https://doi.org/10.1038/s41563-020-0629-4)

Provided by University of Aberdeen

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