

Debuting the Artemis programme identity during a spacewalk outside the International Space Station in August 2019. Source: NASA



# BOOTS ON THE MOON

Platinum's ability to unlock hydrogen technologies could help achieve sustainable space exploration goals

NASA's Artemis lunar exploration programme hopes to send the first woman and the next man to the surface of the moon and prepare for human exploration of Mars.

While 'boots on the moon' are not expected until at least 2024, it is an ambitious programme that aims to open up a new frontier in humankind's exploration of space, using innovative technologies to explore more of the lunar surface than ever before. This knowledge will be used to establish a sustainable presence on the moon that will eventually enable future missions to the red planet.

Ultimately, the intention is for spacecraft to transport crew to (and from) lunar orbit where they will transfer to the 'Gateway', an outpost around the moon to support human and scientific exploration in deep space. Lunar landing systems will take astronauts to the lunar surface. Earlier this month, the European Space Agency signed a contract to provide the Gateway with communications and refuelling.

Throughout the Artemis programme, robots and humans will search for, and potentially extract, resources such as water that can be converted into other usable resources, including oxygen and hydrogen.

By fine-tuning precision landing technologies as well as developing new mobility capabilities, astronauts

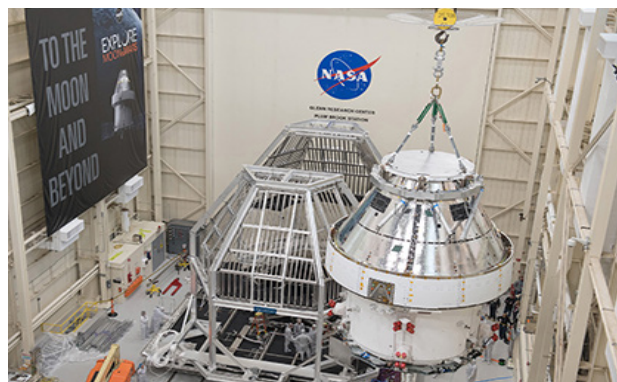
will travel farther distances and explore new regions of the moon.

## Platinum and space travel

Platinum has long-term associations with space exploration; platinum catalysts in hydrogen fuel cells were part of the pioneering technology that paved the way for the first moon landing in 1969, as well as being used on the Space Shuttle missions.

Today, a lunar rover that uses platinum-based fuel cell electric vehicle technologies is being developed in a collaboration between the Japanese Aerospace Exploration Agency and Toyota Motor Corporation.

Platinum catalysts have further hydrogen-related applications which could benefit the Artemis programme, especially given the recent focus on the



The Orion spacecraft will be used in the Artemis programme. Source: NASA

sustainability of human missions to the moon and, in due course, Mars. If ways of using resources that already exist on the moon can be found, this will decrease the cost and complexity of remote missions by reducing the need for supplies delivered from Earth.

For example, it is hoped that hydrogen – a vital fuel source for the space programme – can be derived

from lunar water sources, through electrolysis. Platinum is used as a catalyst in Proton Exchange Membrane (PEM) electrolyzers that use polymer electrolyte, one of the two leading electrolysis technologies currently available.

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