

## MEMBRANE-BASED PROCESSING FOR EXOSPHERIC WATER-GROUP SPECIES CAPTURED ON THE LUNAR SURFACE BY ARTEMIS

### White Paper

Detecting lunar exospheric water-group species by mass spectroscopy is fraught with well known problems. A new approach to measuring species influx is suggested using fuel-cell type membrane-based technology, which is disclosed in U.S. Published Patent Application No. US 2020/0156964 A1 (May 21, 2020). (1) Essentially, it is time for an upgrade. The way the technology works is surprisingly simple. A fuel-cell membrane is coated on one side with a thin film of ionic liquid. The ionic liquid captures water-group species impinging upon the surface of the membrane. An electrical current applied across opposite sides of the membrane causes the captured species to pass through the membrane according to well known fuel cell/electrolyzer principles. The amount of current expended is a measure of the quantity of species processed through the membrane. The degree of hydration of the ionic liquid can also be monitored via its electrical conductivity. Water-group species passed through the membrane can be stored in a collection envelope for further analysis and confirmation.

For deployment by astronauts during Artemis EVAs, the technology takes the form of a series of thin, lightweight panels to be placed on the surface of the Moon. The panels can include battery or solar power. In the case of solar power, solar panels take up a portion of the panel area, leaving the rest for the membrane. Each panel can be provided with telemetry to report data; data can be recorded by each panel and retrieved; and, species collected in the collection envelope can be retrieved along with those remaining in the ionic liquid.

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Patent Pending

### REFERENCES

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3. California, "Method of collecting water on the Moon," U.S. Patent No. 9,061,235 B1 (Jun. 23, 2015) <http://juridic.org/images/US9061235.pdf>
4. California, "Influence of the lunar ambience on dynamic surface hydration on sunlit regions of the Moon," Adv. Space Res. 55(6), 15 Mar. 2015, 1705–1709 <https://doi.org/10.1016/j.asr.2014.12.026>