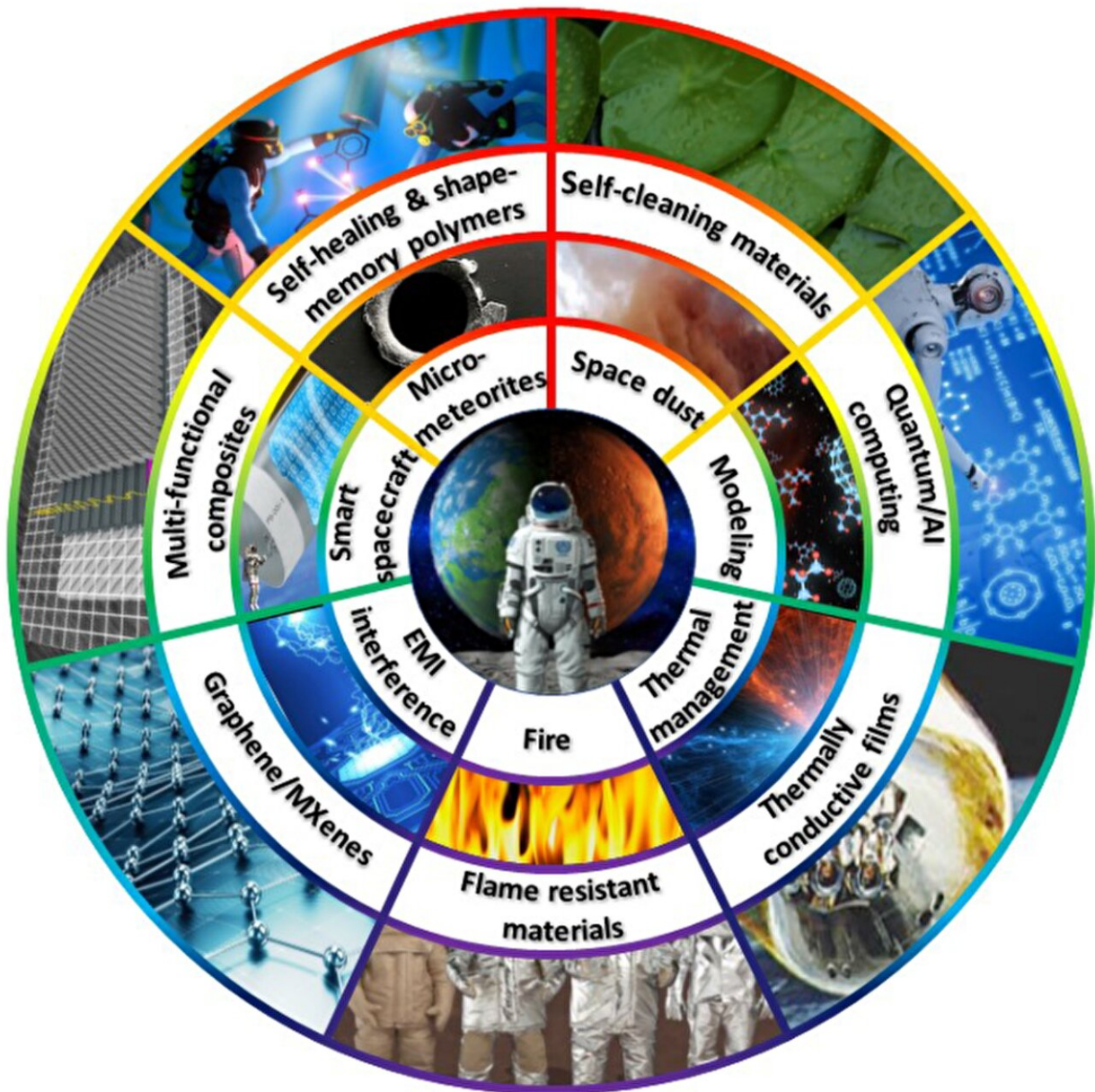


The amazing new materials that hold the key to new space discoveries

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Next-generation materials with multifunctionality, durability and light weight and able to withstand the extreme conditions for advanced space applications. Credit: *Advanced Composites and Hybrid Materials* (2023). DOI: 10.1007/s42114-023-00678-5

Space is a dangerous place. From micro-meteorites and electromagnetic interference to fires in space and extreme heat and cold, we need to develop new materials to enable the next generation of space travel and intergalactic travel.

New Swinburne research published in *Advanced Composites and Hybrid Materials* highlights the cutting-edge materials that are solving these problems, including those being developed by Swinburne's Multifunctional Materials and Composites team.

These include self-healing polymers, fire and thermally resistant materials, materials for [thermal management](#), self-cleaning materials, EMI shielding materials and multifunctional carbon fiber composites.

Lead author and Swinburne Engineering Senior Lecturer Dr. Nisa Salim says space exploration has always been an exciting and expensive endeavor for humanity. "As we push the boundaries of space exploration, ensuring astronaut safety and the long-term operation of space technologies becomes paramount."

"This research serves as a catalog of innovative materials that hold the promise of transforming space exploration," says Salim.

Swinburne Pro Vice-Chancellor Flagship Initiatives, astronomer and article co-author Professor Alan Duffy says "the space environment is one of the most challenging that humanity has ever encountered,

requiring multiple solutions to all be incorporated into a single mission."

"This work brings together an enormous breadth of next-generation technologies that companies and space agencies can adopt to meet the challenges at the final frontier. Swinburne's world-leading teams in astrophysics, materials and surface coating design, and advanced manufacturing offers a vision for a future space sector that can be realized from today's breakthrough research."

Intergalactic material power

"Each challenge demands a specialized solution to enable successful missions," says Dr. Salim.

Dr. Salim's research highlights the following findings about each innovative material:

- Multifunctional carbon fiber composites possess exceptional strength-to-weight ratios and can serve multiple purposes, reducing overall spacecraft weight and boosting mission efficiency.
- EMI shielding materials provide protection against [electromagnetic interference](#) that disrupts communication and [navigation systems](#), ensuring smooth and reliable data transmission in the harsh environment of space.
- Advanced materials with superior thermal management properties can help regulate temperatures and protect sensitive instruments from damage caused by excessive heat or cold.
- Graphene-based wearables have the potential to revolutionize [space](#) exploration by providing lightweight, flexible, and high-performance solutions for astronaut health monitoring, [radiation protection](#), thermal management, energy harvesting,

communication, impact protection, and environmental monitoring.

These findings will help transform the future direction of advancing [space exploration](#) as astronomers and physicists use innovative materials.

More information: J. C. Ince et al, Overview of emerging hybrid and composite materials for space applications, *Advanced Composites and Hybrid Materials* (2023). [DOI: 10.1007/s42114-023-00678-5](https://doi.org/10.1007/s42114-023-00678-5)

Provided by Swinburne University of Technology

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