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Polymer Aerogels for Lunar Survivability (PALS)

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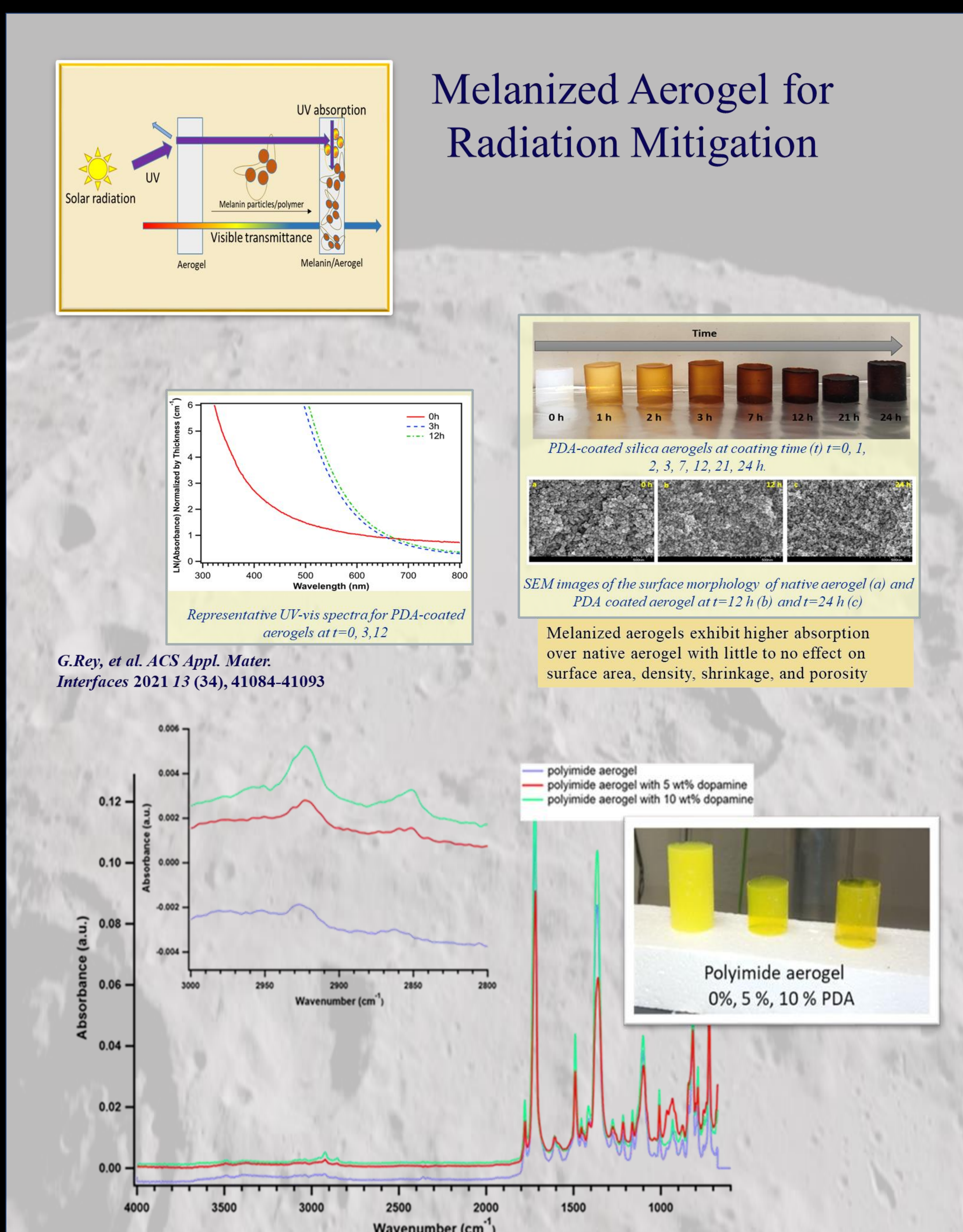
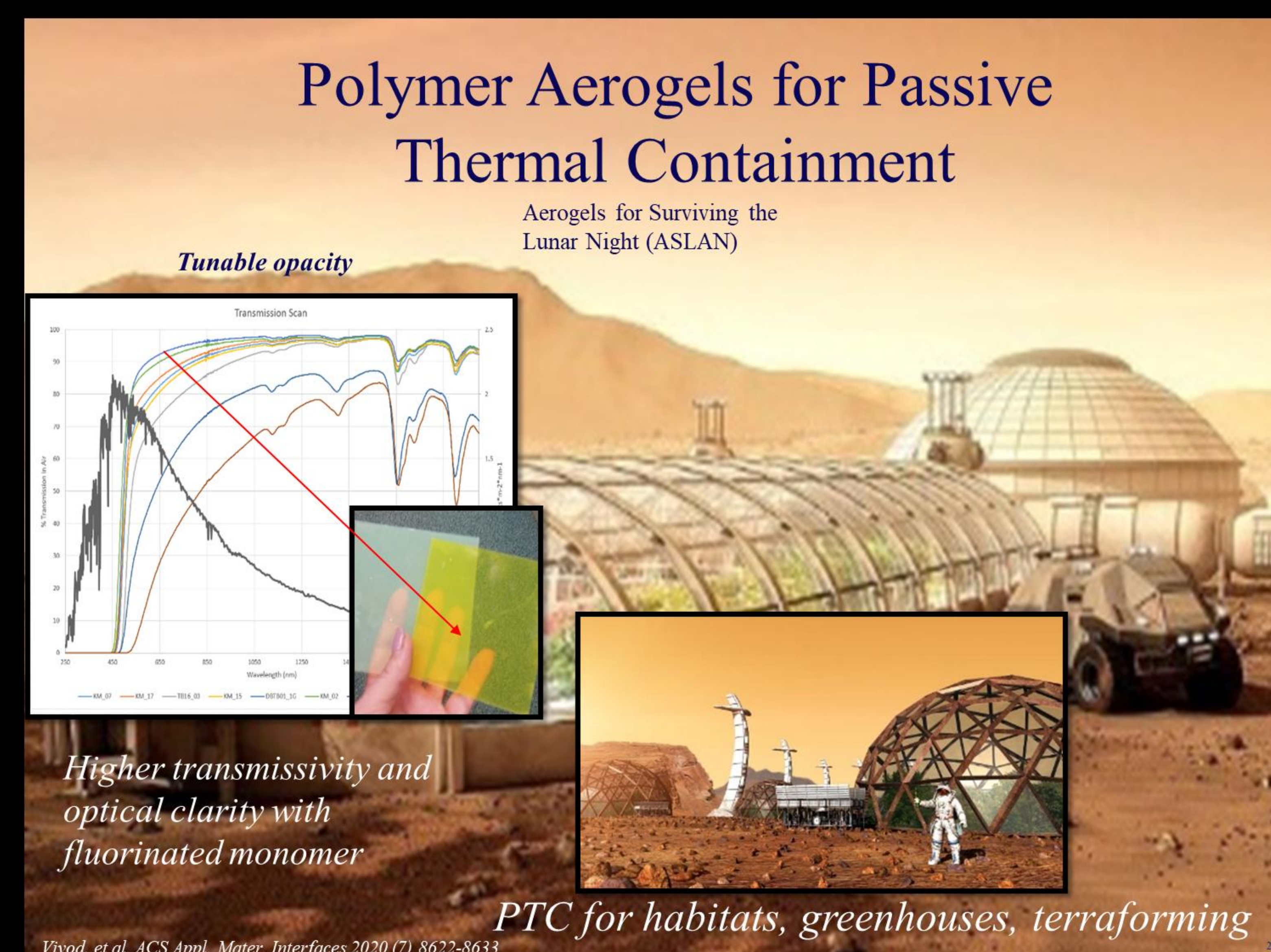
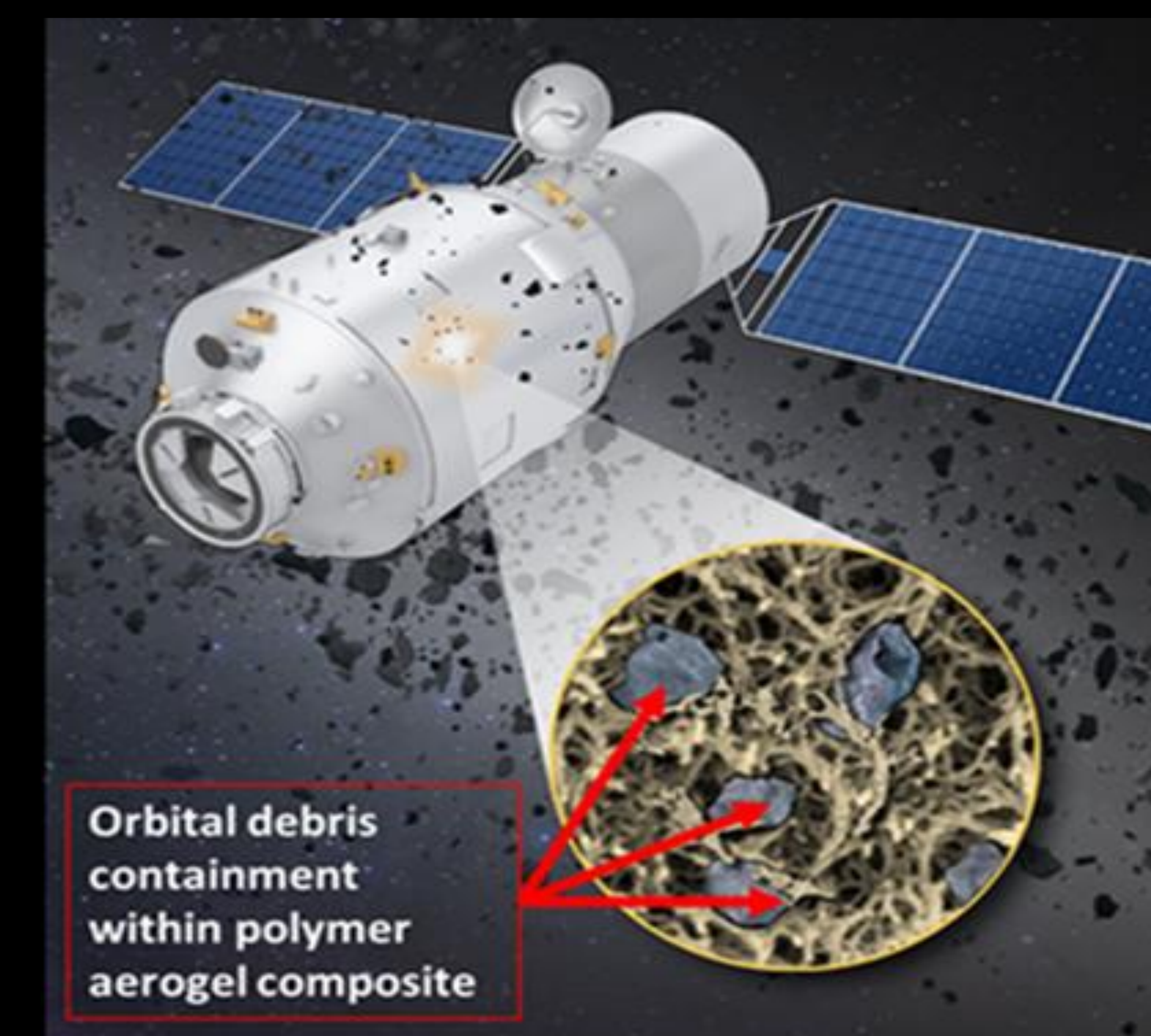
As the Space Community endeavors to reach new heights of exploration, materials for extreme environment are on the forefront of research. One such material would include polymer aerogels; lightweight solids with nano-scale pore size (10-20 nm), high internal surface area (500-850 m^2/g), low thermal conductivity (~20 mW/K), low density (0.15-0.05 g/cm^3) and extremely high porosities (>95%). Due to these interesting properties, aerogels are ideal as thermal insulators and are by no means limited to this application. The high porosity combined with high surface area, make aerogels an ideal host system for particle incorporation for applications such as IR filtration, sensor platforms, as well as vibro-acoustic, dust, and radiation mitigation materials.



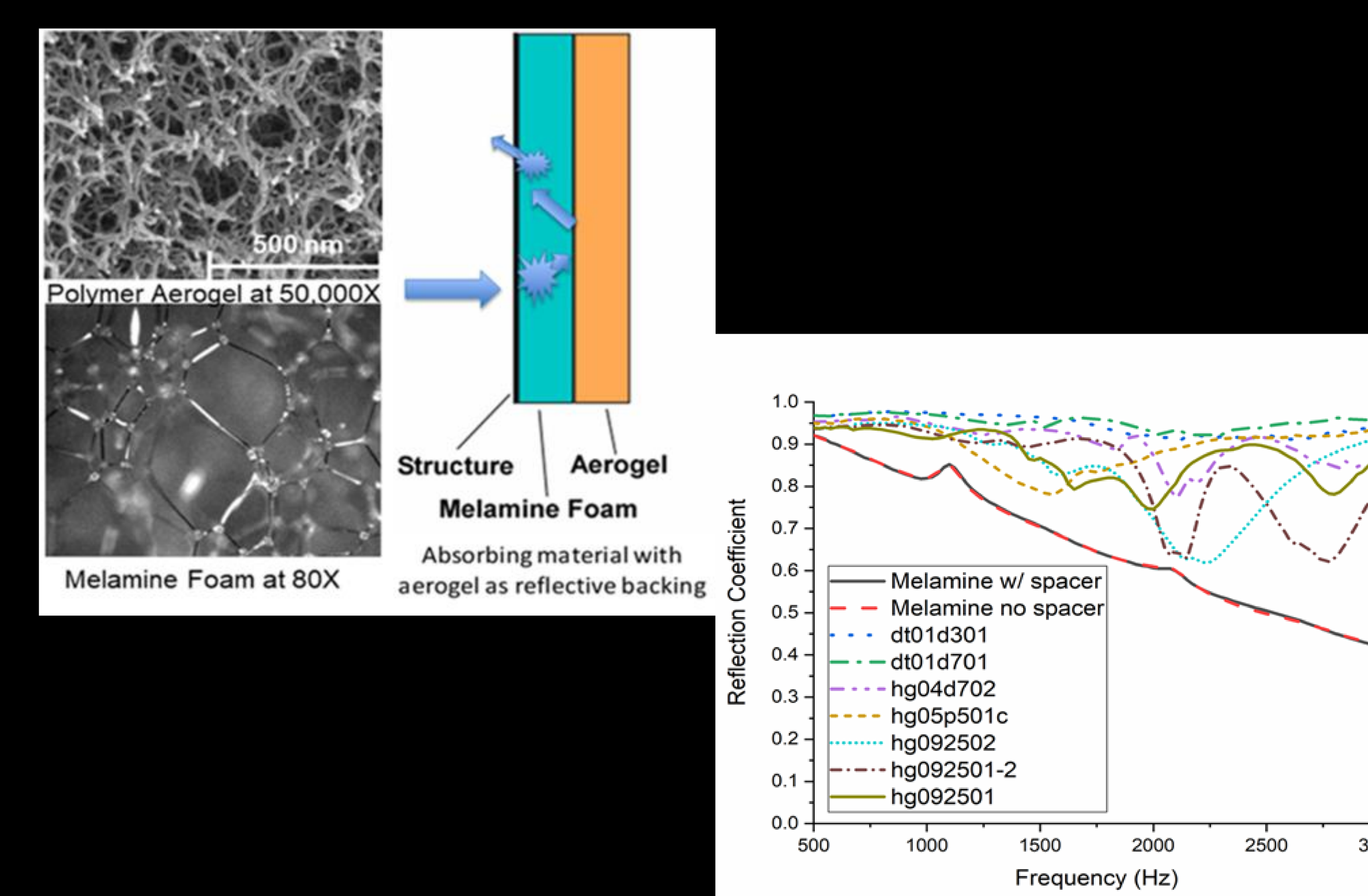
Radiation resistance and robust structural integrity was achieved by creating an aerogel with a conformal coating of a radiation mitigating polymer (melanin) throughout its underlying matrix





Passive radiative transfer to be able to heat an internal target while the polymer aerogel structure acts as a thermal trap similar to a greenhouse.

PI aerogel is 30-60 times more thermally insulating than glass at RT and ambient pressure



Advanced Acoustic Materials for Noise Mitigation

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