NASA SBIR 2018 Phase I Solicitation

H4.02 Controllable, Tinting, Polycarbonate Compatible Coatings for Advanced EVA Spacesuit Visor

Lead Center: JSC

Technology Area: TA6 Human Health, Life Support and Habitation Systems

For the next generation of NASA's space suits, being able to enable an architecture for microgravity and planetary capabilities is required. To support these future missions, we will need support hardware to be designed, such as a new extravehicular visor assembly (EVVA) to protect the astronautâ€™s eyes from the damaging UV rays of the sun. The EMU has an EVVA that is a sun visor that can be manually deployed by the crew members. This changes the radiation protection from just UV via the clear helmet to a reflective visor that blocks visible light and IR via the gold visor. Unlike the EMU EVVA design, the new EVVA will need to integrate with the exploration space suit helmet bubble, which is a 10â€x13â€ hemi-ellipsoid dome. We feel that in this new design we have a unique opportunity to integrate the new technologies in the field of actively controlled coatings that affect tint-ability, UV protection, and optimized transmittance through our EVVA. Focus areas of coating technology that appeal to the team are electrochromics and solar variable reflectance, but we are open to other novel solutions.

The goal at the end of Phase I SBIR is to have a tabletop prototype helmet bubble that is coated with a controllable tint that would demonstrate the technology needed to replace the EVVA reflective visor.

Phase I Performance Targets:

- Transmittance requirements in off state: 450 nm N/A, 550 nm 70% min, 1100 N/A.
- Transmittance requirements in on state: 450 nm 10+/-4%, 550 16+/-4%, and 1100 nm 10% max.
- Cannot hinder visibility in a failed state.
- Must be thermally stable in the space environment.
- Concepts of how to make it operable with a gloved hand.
- If required, low power consumption.

Phase II would require the coating to meet the same requirements as seen in Phase I, but to deliver a full helmet bubble prototype that could interface with NASA's Z-2 spacesuit for a suited demonstration. Examples of Phase II performance targets would include ability to autosense UV/light with the ability to turn on/off the coating automatically, integrating a scratch resistant coating, a packaged power supply (if needed) that is dust resistant and tolerant to the space environment, and packaged controls for the crew member that are operable with a gloved hand.Â