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Using Piezoelectric Ceramics for Dust Mitigation of Space Suits

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Abstract: The particles that make up moon dust and Mars soil can be hazardous to an astronaut s health if not handled properly. In the near future, while exploring outer space, astronauts plan to wander the surfaces of unknown planets. During these explorations, dust and soil will cling to their space suits and become imbedded in the fabric. The astronauts will track moon dust and mars soil back into their living quarters. This not only will create a mess with millions of tiny air-born particles floating around, but will also be dangerous in the case that the fine particles are breathed in and become trapped in an astronaut s lungs. research center are investigating ways to remove these particles from space suits. This problem is very difficult due to the nature of the particles: They are extremely small and have jagged edges which can easily latch onto the fibers of the fabric. For the past summer, I have been involved in researching the potential problems, investigating ways to remove the particles, and conducting experiments to validate the techniques. The current technique under investigation uses piezoelectric ceramics imbedded in the fabric that vibrate and shake the particles free. The particles will be left on the planet s surface or collected a vacuum to be disposed of later. The ceramics vibrate when connected to an AC voltage supply and create a small scale motion similar to what people use at the beach to shake sand off of a beach towel. Because the particles are so small, similar to volcanic ash, caution must be taken to make sure that this technique does not further inbed them in the fabric and make removal more difficult. Only a very precise range of frequency and voltage will produce a suitable vibration. My summer project involved many experiments to determine the correct range. Analysis involved hands on experience with oscilloscopes, amplifiers, piezoelectrics, a high speed camera, microscopes and computers. perfect this technology. Someday, vibration to remove dust may a vital component to the space exploration program. In order to mitigate this problem, engineers and scientists at the NASA-Glenn Further research and experiments are planned to better understand and ultimately

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