

Self-cleaning technology from Mars can keep terrestrial solar panels dust free

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Researchers have developed technology for large-scale solar power installations to self-clean. Credit: US Air Force

Find dusting those tables and dressers a chore or a bore? Dread washing the windows? Imagine keeping dust and grime off objects spread out over an area of 25 to 50 football fields. That's the problem facing companies that deploy large-scale solar power installations, and scientists today presented the development of one solution -- self-dusting solar panels -- based on technology developed for space missions to Mars.

In a report at the 240th National Meeting of the American Chemical Society (ACS), they described how a self-cleaning [coating](#) on the surface of [solar cells](#) could increase the efficiency of producing electricity from sunlight and reduce maintenance costs for large-scale solar installations.

"We think our self-cleaning panels used in areas of high dust and particulate pollutant concentrations will highly benefit the systems' solar energy output," study leader Malay K. Mazumder, Ph.D. said. "Our technology can be used in both small- and large-scale photovoltaic systems. To our knowledge, this is the only technology for automatic dust cleaning that doesn't require water or mechanical movement."

Mazumder, who is with Boston University, said the need for that technology is growing with the popularity of solar energy. Use of solar, or photovoltaic, panels increased by 50 percent from 2003 to 2008, and forecasts suggest a growth rate of at least 25 percent annually into the future. Fostering the growth, he said, is emphasis on [alternative energy sources](#) and society-wide concerns about sustainability (using resources today in ways that do not jeopardize the ability of future generations to meet their needs).

Large-scale solar installations already exist in the United States, Spain, Germany, the Middle East, Australia, and India. These installations usually are located in sun-drenched desert areas where dry weather and winds sweep dust into the air and deposit it onto the surface of solar panel. Just like grime on a household window, that dust reduces the amount of light that can enter the business part of the solar panel, decreasing the amount of electricity produced. Clean water tends to be scarce in these areas, making it expensive to clean the solar panels.

"A dust layer of one-seventh of an ounce per square yard decreases solar power conversion by 40 percent," Mazumder explains. "In Arizona, dust is deposited each month at about 4 times that amount. Deposition rates are even higher in the Middle East, Australia, and India."

Working with NASA, Mazumder and colleagues initially developed the self-cleaning solar panel technology for use in lunar and Mars missions. "Mars of course is a dusty and dry environment," Mazumder said, "and

solar panels powering rovers and future manned and robotic missions must not succumb to dust deposition. But neither should the solar panels here on Earth."

The self-cleaning technology involves deposition of a transparent, electrically sensitive material deposited on glass or a transparent plastic sheet covering the panels. Sensors monitor dust levels on the surface of the panel and energize the material when dust concentration reaches a critical level. The electric charge sends a dust-repelling wave cascading over the surface of the material, lifting away the dust and transporting it off of the screen's edges.

Mazumder said that within two minutes, the process removes about 90 percent of the [dust](#) deposited on a solar panel and requires only a small amount of the electricity generated by the panel for cleaning operations.

The current market size for solar panels is about \$24 billion, Mazumder said. "Less than 0.04 percent of global energy production is derived from [solar panels](#), but if only four percent of the world's deserts were dedicated to solar power harvesting, our energy needs could be completely met worldwide. This self-cleaning technology can play an important role."

Provided by American Chemical Society

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