

Air Force Funds Research into Oil Repellent Surfaces

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1/24/2008 - ARLINGTON, Va. (AFPN) -- Air Force Office of Scientific Research officials here currently are funding investigations into super oil repellent surfaces because of their potential utility in cleaning up jet fuel spills and protecting aircraft or rocket parts from fuel absorption.

Drs. Gareth H. McKinley and Robert E. Cohen, professors of engineering at the Massachusetts Institute of Technology, are exploring man-made and natural surfaces that keep gasoline and oil from soaking in and spreading out over a surface.

The challenge is the low value of the surface tension of many oils, which makes them spread over surfaces very easily. Surface tension is a measure of the attraction between molecules of the same composition. The researchers' goal is to design new solid surfaces with very low interfacial energies that can repel oily liquids.

"Nature has developed a lot of methods for waterproofing, but not so much oil-proofing," Dr. McKinley said in an MIT news article by Anne Trafton. "The conventional wisdom was that it couldn't be done on a large scale without very special lithographic processes, which duplicate microcomponents."

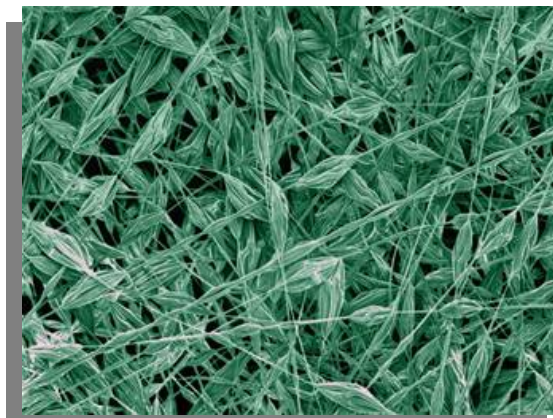
After studying the water repellent surfaces of lotus leaves, Drs. McKinley and Cohen created a microfiber fabric that can be deposited onto aircraft surfaces via a process known as electrospinning. The microfibers contain fluorinated nanoparticles, FluoroPOSS, which are synthesized by Dr. Joe Mabry and colleagues at Edwards Air Force Base, Calif.

"It's the combination of chemistry on the nanoscale level and fiber structure on the micrometer scale that gives rise to our materials' oil-repelling nature," Dr. McKinley said.

"Many people are addressing materials that repel water, but not too many are researching oil repellents, a research topic which is important for many Air Force systems," said Dr. Charles Lee, the AFOSR program manager for the project. "This collaborative research involving scientists at MIT and Edwards AFB will be important for making future systems more maintenance free."

The scientists' work may lead to protective coatings for airplane parts, which are vulnerable to fuel leaks. The researchers may also create fuel-line gaskets with the new technology because gaskets typically swell substantially when they absorb gasoline.

Air Force officials said they hope that such materials will significantly address the effects of fuel spills, making clean-up of fuel or oil-soaked equipment far easier.



Air Force Office of Scientific Research officials are funding investigations into super oil repellent surfaces. This graphic shows the magnification of FluoroPOSS microfiber, which is water and oil repellent. It is typically up to 5 microns in diameter, or one-twentieth the diameter of a human hair. (Courtesy image)

Source: <http://www.af.mil/news/story.asp?storyID=123083519>