

# Aerospace Materials

## SILICONES JUST WON'T STICK

This modified crosslinked silicone polymer seems almost too good to be true. According to developer Keith Kent, it is stable, heat and chemical resistant, nontoxic, and slippery. Virtually nothing sticks to it; you could probably even use it to coat frying pans. Sounds like DuPont's Teflon, right? But unlike PTFE, this polymer can be applied directly to almost any surface without etching, primers, or other pretreatments. What Kent has done is to modify an exceptionally inert material so that only one end of the polymer chain is reactive. Just paint it on and the reactive groups bond tightly to the surface. It doesn't need to cure, and it is almost impossible to scrape off. When you think of aerospace applications, start with maintenance. Since dirt and dust do not adhere to the coating, you can clean jumbo jets with soapy water. In fact, Kent believes you can wash off a good deal of grime just by flying through a cloud. He also notes that the silicone has been used to reduce air resistance on record-breaking flights. While the material is expensive per pound, it is applied as so thin a film that 2 ounces will coat a 70-ft yacht. You can also apply it as an aqueous solution. The technology is patented (U.S. 4,839,456) and the developer is looking for joint development projects. Kent Integrated Scientific Systems. Circle Reader Service No. 351.

## SILICONES WITH TEFLONLIKE PROPERTIES

Kent Integrated Scientific Systems (KISS), a Florida research boutique, has discovered a new family of silicone-based antistick coatings. While developer Keith Kent shies away from comparing them to Teflon, the similarities are striking. Like Teflon, this silicone forms a stable, chemically resistant, nontoxic, slippery surface. Virtually nothing will stick to it. It resists heat. You can even use it to coat frying pans.

But that's where the comparison ends. Unlike Teflon, this silicone is easy to apply. There's no need for etching, primers, or other pretreatments. Just spray or paint it and it will adhere to most metals. The key: a proprietary process that modifies crosslinked silicone, a highly inert material, so one end of the polymer chain is reactive. It requires no cure time, and once applied, it's almost impossible to scrape off.

The list of potential applications for this thin nonstick coating is amazing. You could use it to protect automotive finishes and simplify maintenance (cleaning takes only mild soap and water). Or use it to keep barnacles and marine organisms from sticking to boats. Lightfield Ammunition (Adelphi, NJ) has coated the front end of projectiles and increased muzzle velocity by 10%. The U.S. Marines are evaluating the new coating for windows and heavy equipment so they don't have to drag pressurized cleaning equipment into the field. The Navy believes it might cut the friction of hulls in the water.

You could coat metals to prevent corrosion. Reduce friction on aircraft as they fly through the air. Coat vaccine needles so they slide into the skin easier. Reduce the likelihood of clotting in artificial blood vessels. Improve mold release for plastics and composites. Make breathable clothing that lets water vapor escape but prevents water liquid from penetrating.

While the cost of the material is prohibitive on a per-pound basis, miniscule amounts are needed to complete large jobs. You could coat a 70-ft yacht with 2 oz. At the retail level, it might cost \$10 to \$15 to coat the cab of a semitruck, and \$10 to coat a car from bumper to bumper.

Better, researchers have learned to dissolve the material in water, rather than in solvents that could pose environmental problems. Although the aqueous formulation requires time to set, the final result is still a waterproof finish.

The technology is patented (U.S. 4,839,456). The company is interested in joint-ventures, joint development of new products, and contract research.

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