

## High-Performance Fabric

### Plasma treatment could push fabrics to a higher level of performance.

A microelectronics revolution arose from the use of plasma for manufacturing computer chips. Now plasma, an ionized gas consisting of electrons, ions, and chemically active neutral fragments, is revolutionizing the clothes we wear.

Former Los Alamos staff member Gary Selwyn recognized that plasma used in a vacuum (as it is for computer chips) might also be used at atmospheric pressure, under the right conditions. Pursuing that idea, he developed a technique in which a jet of plasma was used to decontaminate vehicles and equipment. It was, in effect, one of the Laboratory's first homeland security projects. To commercialize the plasma jet, Selwyn founded APJeT, a Santa Fe company, and licensed the technology from the Laboratory.

The high cost of vacuum plasma had kept plasma treatment from being used for commodity items, but the new atmospheric plasma-jet opened the door. APJeT targeted fabric treatment for the high-performance outdoor clothing market.

Using helium for the plasma gas was one key to success, allowing APJeT to develop a high-density (for treatment speed) atmospheric plasma that was also "nonthermal"—cool enough for use with fabric. Helium has a high thermal conductivity that allows any heat generated to be easily removed. In addition, helium is unique in that it prevents arcing (sparking), a common problem with atmospheric plasmas. Suddenly, the complicated, vacuum-based plasma that was used before could be created at atmospheric pressure and room temperature.

As a result, APJeT's methods can take a commodity textile product—woven or knitted polyester—and turn it at low cost into a product rivaling DuPont and Gore-Tex products. In addition, because APJeT's fabric finishing is plasma-based and so done in the gas phase (unlike traditional "wet" methods), fabrics can be given sequential single-side treatments to produce a product that repels water and stains on the outside and absorbs moisture on the inside.

APJeT's plasma machine is manufactured under license by Morrison Plasma Systems. Installed at the College of Textiles at North Carolina State University, it is currently being demonstrated for customers.