



# Air Force Research Laboratory | AFRL

*Science and Technology for Tomorrow's Aerospace Force*

## **Success Story**

### AFRL DRIVES TRANSFER OF ADVANCED MATERIAL FOR HIGH PERFORMANCE ELECTRONIC COMPONENTS



Current, commercial, state-of-the art (SOTA) power capacitors are becoming unreliable in military systems due to the high temperatures produced in modern weapon systems. A program led by the Propulsion Directorate developed a fluorene poly-ester (FPE) capacitor film, which has twice the operating temperature capability of SOTA capacitors. This film also enables power capacitors with a 40% decrease in weight and 30% increase in reliability.



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### **Accomplishment**

Under the high temperature dielectric program, the directorate's Electrical Branch, developed a flourene poly-ester (9,9-bis- (4-hydroxphenyl)-flourene iso/terepthlate) dielectric film with properties beyond SOTA polycarbonate and polypropylene films. Current capacitors have a high temperature capability of 125°C. This film has a high-temperature capability of 250°C and also two times the voltage breakdown strength of polycarbonate films. These characteristics enable capacitors with the capability of handling the temperatures seen in current weapons systems that are beginning to exceed SOTA capacitor capability in some instances. The film also has applications in severe-environment commercial applications, such as "in hole" oil well applications, aircraft engine ignition systems, and medical defibrillators.

### **Background**

While the military requires high performance capacitors to satisfy mission requirements, the military is a low volume user compared to commercial applications. Both capacitor and capacitor film manufacturers are reluctant to develop capacitors or film to meet these requirements as long as their current capacitors satisfy high volume commercial customer applications. As a result, a program with industry to develop and produce a capacitor film to meet high-performance military requirements. This effort involved over 17 organizations – two government and 15 commercial enterprises. The directorate worked with the film producers as well as capacitor manufacturers and, after several years, by October 1999, a capacitor grade 12-micron film was available to capacitor manufacturers. There is also a need for thinner films, in the 2- to 6- micron range for certain applications. The directorate's efforts resulted in one firm working to produce the casting process for these thinner films and two other firms who will use the casting process in a production mode.

Propulsion Directorate

Additional information

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