THIN FILM...LARGE PAYOFF

Good things come in small packages. In the case for space, ultra-thin film can be tightly packaged for launch, then deployed in orbit to establish large solar concentrators and antennas for geographical surveys and communications. Lightweight, inflatable structures will soon act as huge reflectors that focus the sun's energy to heat propellant for thrusting payloads to high altitudes. Gossamer-like thin film might take the shape of collecting and transmitting dishes for 21st century satellites that collect solar energy, then beam the energy to Earth.

SRS Technologies, Huntsville, Alabama, has been working on the cutting-edge of thin-film concentrators for over ten years. A progressive series of Small Business Innovation Research (SBIR) contracts awarded to SRS has come from Langley Research Center and Marshall Space Flight Center. In particular, Langley Research Center funded SBIR awards focused on the use of large thin-film concentrators for large space-based antennas. SRS has licensed and now produces commercially several NASA-developed polyimides—a colorless, low dielectric, radiation-resistant, and moisture-resistant material developed for high-temperature applications. "Through the SBIR programs, SRS Technologies has been able to develop a unique competitive advantage and provide solutions to difficult problems," says Harold Pastrick, Corporate Vice President of SRS Technologies.

These polyimides' transparencies are superior to competing polyimides. The materials solubilities provide design and processing flexibility. NASA developed the materials to meet requirements for a transparent colorless material that exhibits extreme thermal stability and greater resistance to radiation and atomic oxygen in low Earth orbits.

SRS now manufactures under license the NASA-developed polyimides as powder, resin, and rolled film. These materials, known as LaRC™-CP1 and LaRC™-CP2, have exhibited good long-term storage capability, which enables SRS to produce large inventories. SRS has had great success applying the materials to thin-film deployable concentrator/antenna technologies. A 16-foot on-axis antenna was built for Langley Research Center. One recent test demonstrated the thin film's characteristics to form a 23-foot diameter antenna dish. It weighed in at an impressive seven pounds. SRS has spun-cast films up to several feet in diameter, while larger films have been solution-cast.

SRS Technologies currently produces two polyimides, the LaRC™-CP1 and LaRC™-CP2. These polyimides offer many advantages over commercially available polyimide materials, including thermal stability, radiation resistance solubility, and transparency.

These SRS polyimide's can be used in laminates, films, molded parts, and stock shapes. Thickness of the thin film can widely vary, ranging from 0.3 mils to 2.0 mils, up to 24 inches in width. SRS plans to increase production of film from 48-inch to 60-inch widths in the near future.

SRS's production and use of the NASA-developed polyimides have positioned SRS for promising commercial opportunities. Those promising business opportunities include production of rolled-film material using an SRS-designed machine, made possible through the SBIR program. Currently, SRS is the only company in the world licensed to produce this unique product commercially.

NASA's Technology Applications Team at Research Triangle Institute (RTI) has worked closely with the Langley Research Center to assist in providing in-depth analysis of the potential applications and market factors affecting the commercial viability of the materials. RTI has helped NASA market the technology and develop licensing and cooperative development agreements with interested companies. SRS Technologies signed an agreement with NASA, and is currently the only company licensed to produce the colorless polyimides.

Five major applications for the polyimides were identified and studied in detail by RTI. These were: flat panel displays, microelectronics, coatings, solar arrays, and thermal control materials. RTI's efforts helped to facilitate the SRS license and cooperative development efforts.

Additional applications for these temperature and radiation resistant, colorless, and/or low dielectric polyimide materials may include: flexible printed circuit substrates, high temperature wire and cable wrapping, electric motor and generator insulation, and possibly protective coatings for art and outdoor statues. Several companies are currently assessing the thin-film technology for specific applications.

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