THE NASA HIGH TEMPERATURE SUPERCONDUCTIVITY PROGRAM

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ABSTRACT

It has been recognized from the onset that high temperature superconductivity held great promise for major advances across a broad range of NASA interests. The current effort is organized around four key areas: communications and data, sensors and cryogenics, propulsion and power, and space materials technology. Recently, laser ablated $YBa_2Cu_3O_{7-x}$ films on LaAlO produced far superior RF characteristics when compared to metallic films on the same substrate. This achievement has enabled a number of unique microwave device applications, such as low insertion loss phase shifters and high-Q filters. Melt texturing and melt-quenched techniques are being used to produce bulk material with optimized magnetic properties. These Yttrium-enriched materials possess enhanced flux pinning characteristics and will lead to prototype cryocooler bearings. Significant progress has also occurred in bolometer and current lead technology. Studies are being conducted to evaluate the effect of high temperature superconducting materials on the performance and life of high power magneto-plasma-dynamic thrusters. Extended studies have also been performed to evaluate the benefit of superconducting magnetic energy storage for LEO space station, lunar and Mars mission applications. The projected direction and level of effort of the program are also described.