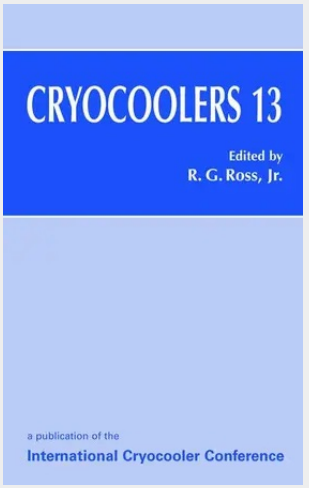
Ross

Cryocoolers 13



The last two years have witnessed a continuation in the breakthrough shift toward pulse tube cryocoolers for long-life, high-reliability cryocooler applications. New this year are papers de scribing the development of very large pulse tube cryocoolers to provide up to 1500 watts of cooling for industrial applications such as cooling the superconducting magnets of Mag-lev trains, coolmg superconducting cables for the power mdustry, and liquefymg natural gas. Pulse tube coolers can be driven by several competing compressor technologies. One class of pulse tube coolers is referred to as "Stirling type" because they are based on the linear Oxford Stirling-cooler type compressor; these generally provide coolmg m the 30 to 100 K temperature range and operate ^t frequencies from 30 to 60 Hz. A second type of pulse tube cooler is the so-called "Gifford-McMahon type. " Pulse tube coolers of this type use a G-M type compressor and lower frequency operation (~1 Hz) to achieve temperatures in the 2 to 10 K temperature range. The third type of pulse tube cooler is driven by a thermoacoustic oscillator, a heat engine that functions well in remote environments where electricity is not readily available. All three types are described, and in total, nearly half of this proceedings covers new developments in the pulse tube arena. Complementing the work on low-temperature pulse tube and Gifford-McMahon cryocoolers is substantial continued progress on rare earth regenerator materials.

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