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Low-thermal conductivity suspensions used in the isolation of the salt pills aboard the Astro-H Adiabatic Demagnetization Refrigerator

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An adiabatic demagnetization refrigerator (ADR) utilizes the magnetocholoric effect in a paramagnetic salt to produce sub-Kelvin temperatures. It is a solid-state device that has no moving parts and does not rely upon a density gradient in a working fluid. This makes it ideal for cooling space-based instruments. Typically the salt is enclosed in a cylindrical pill that is suspended within the bore of a magnet. The suspension between the salt pill and magnet must be robust enough to survive a launch yet have a thermal conductance that minimizes heat from the magnet that is mechanically, and thermally, anchored to a stage at a higher temperature. Here we detail such a design that uses Kevlar™ as the supporting media in a system that limits motion of the salt pill axial as well as laterally with respect to the magnet bore.

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