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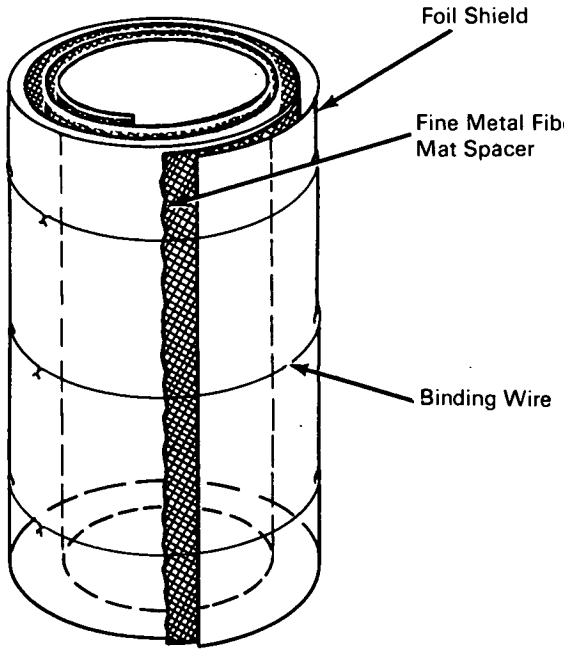
Brief 65-10188

NASA TECH BRIEF

Refractory Metal Shielding (Insulation) Increases Operating Range of Induction Furnace



The problem: The operating range of an induction furnace is partially determined by the degree to which escaping heat, in the form of radiation, can be contained. Ceramic oxide refractory materials insulate well to 3000°F. Multiple shielding with a composite of refractory metal and ceramic oxide is effective to about 4500°F but the ceramic component is susceptible to thermal shock and crystalline instability above that level. Effective thermal shielding is needed to operate induction furnaces at temperatures above 5500°F.

The solution: A thermal radiation shield consisting, alternately, of a sheet of refractory metal foil and a loosely packed mat of refractory metal fibers in a concentric pattern. This shielding contains the radiation from the furnace until it approaches the melting temperature of the shielding material.

How it's done: Tungsten foil is alternated with a tungsten spacer. This spacer may be in the form of a loosely packed fibrous mat, fiber felt sheet, woven wire mesh, or corrugated foil. The foil and spacer lamination is then wound about the furnace to the desired thickness. The shielding is then banded on the outside with tungsten wire.

Notes:

1. This shielding is compact, lightweight, and simple to fabricate and, because of its low mass density, exhibits little thermal inertia, thereby permitting more rapid thermal cycling.

(continued overleaf)

2. A tungsten foil–tungsten fiber mat composite was tested on a vacuum induction furnace and a temperature of 5850°F was reached. Tungsten melts at approximately 6100°F.
3. This shielding technique should be of interest to manufacturers and users of high temperature ovens, high temperature fluid lines, chemical reaction vessels, etc.
4. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio, 44135
   Reference: B65-10188

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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