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heating. Electric current through the element encounters resistance, resulting in heating of the element.

, ribbon, or strip. Nichrome 80/20 is an ideal material, because it has relatively high resistance and forms an oxide layer beneath the wire which will not oxidize, preventing the wire from breaking or burning out.

- Resistance wire: may be wire or ribbon, straight or coiled. Used in common items such as toasters and hair dryers, furnaces for industrial heating, floor heating, roof heating, pathway heating to melt snow, dryers etc. Most common wires are from the following classes

Kanthal (FeCrAl) wires

Nichrome 80/20 wire and strip

Cupronickel (CuNi) alloys for low temperature heating

- Molybdenum disilicide (MoSi₂, molybdenum silicide, or MOSi₂), an intermetallic compound, a silicide of molybdenum, is a refractory ceramic with primary use in heating elements. It has moderate density, melting point 2030 °C, and is electrically conductive. At high temperatures it forms a passivation layer of silicon dioxide, protecting it from further oxidation. Application area is Glass Industry, Ceramic sintering, heat treatment furnaces, semiconductor diffusion furnace

Kanthal Super (<http://www.kanthal.com/products/furnace-products-and-heating-systems/electric-heating-elements/molybdenum-disilicide-heating-elements/>)

- Molybdenum disilicide doped with Al or Mo(Si,Al)₂, an intermetallic compound, a silicide of molybdenum, is a refractory ceramic with primary use in heating elements. At high temperatures it forms a passivation layer of alumina (Al₂O₃) protecting it from corrosion or further oxidation. Application area is Glass Industry, Ceramic sintering, heat treatment furnaces, semiconductor diffusion furnace. Working 300 °C higher in reducing atmospheres than MoSi₂.

Kanthal Super ER (<http://www.kanthal.com/products/material-datasheets/ceramic-elements/molybdenum-disilicide/kanthal-super-er/>)

- Screen-printed metal-ceramic tracks deposited on ceramic insulated metal (generally steel) plates. These elements have found widespread application for kettles and other domestic appliances since the mid 1990s.
- Etched Foil: elements are generally made from the same alloys as Resistance wire elements, but are produced with a subtractive photo-etching process that starts with a continuous sheet of metal foil and ends with a complex resistance pattern. These elements are commonly found in precision heating applications such as Medical Diagnostics, Satellite, and Aerospace.
- Tubular (sealed element, often known by the trademark "Calrod"): a fine coil of Nickel chrome wire in a ceramic insulating binder (MgO, alumina powder), sealed inside a tube made of stainless steel or brass. These can be a straight rod (as in toaster ovens) or curved to span an area to be heated (such as in electric stoves, ovens, and coffee makers).
- Heat lamp: a high-powered incandescent lamp usually run at less than maximum power to radiate mostly infrared instead of visible light. These are usually found in radiant space heaters and food warmers, taking either a long, tubular form or an *R40* reflector-lamp form. The reflector lamp style is often tinted red to minimize the visible light produced; the tubular form is always clear.
- PTC ceramic: This material is named for its Positive Thermal Coefficient of resistance. Most ceramics have a negative coefficient; most metals, a positive one. While metals do become slightly more resistant at higher temperatures, this class of ceramics (often barium titanate and lead titanate composites) has a highly nonlinear thermal response, so that it becomes extremely resistant above a composition-dependent threshold temperature. This behavior causes the material to act as its own thermostat, since current passes when it is cool, and does not when it is hot. Thin films of this material are used in automotive rear-window defrost heaters, and honeycomb-shaped elements are used in more expensive hair dryers and space heaters.
- Thick film technology:

Heating elements for high-temperature furnaces are often made of exotic materials, including platinum, molybdenum disilicide, molybdenum (vacuum furnaces) and silicon carbide. Silicon carbide igniters are common in gas ovens.

Kanthal offer wide solutions of heating elements for industrial applications.

See also

- Thermoelectric effect
- Positive temperature coefficient
- Heated hose
- Heating mantle
- Molybdenum disilicide

External links

- Sam's Repair FAQ - heating elements (<http://repairfaq.ece.drexel.edu/sam/appfaq.htm#afheatelem>)
- Kanthal-Heating Elements (<http://www.kanthal.com>)

Retrieved from "http://en.wikipedia.org/wiki/Heating_element"

Categories: Heating

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