Heraeus

Pt DPH

Pt DPH is an oxide dispersion hardened grade of pure platinum which is used in high temperature applications when the use of solid solution hardening by alloying elements such as rhodium, iridium or gold cannot be tolerated.

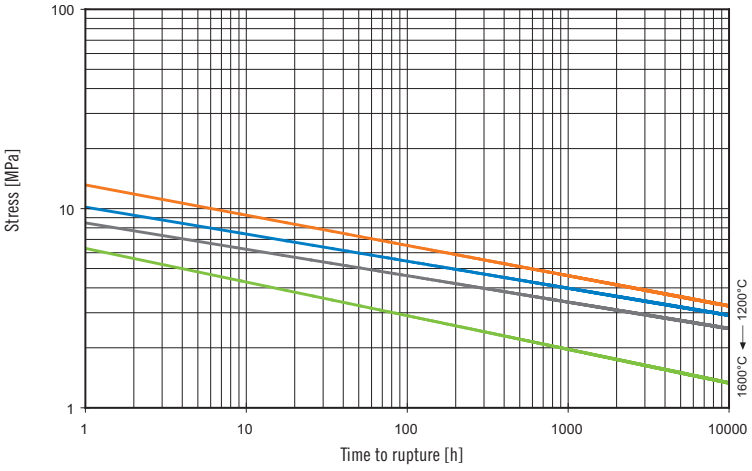
Typical applications are crucibles and other equipment for processing special optical glasses, as the alloying elements can cause an unacceptable discoloration of the glass. For similar reasons, crucibles of Pt DPH are used in the manufacture of many single crystals by the Czochralski and Bridgman processes.

Particularly in periods of high rhodium prices, Pt DPH is also used as a lining for refractory components. In this case, the refractory takes on the main load-bearing function.

A further application is in thermocouple thimbles for use in glass melts containing sulphur. The sulphur in the glass can react with rhodium in Pt-Rh alloys leading to the formation of a eutectic that melts at 925°C, thus destroying the thimble. In contrast, thimbles of Pt DPH can be used in similar environments at temperatures exceeding 1200°C.

Stress-Rupture Strength of Pt DPH

Stress-rupture test: A specimen of the material is subjected to a defined stress and the time to rupture of the specimen is determined. The time to rupture is measured for each temperature on a large number of specimens at different stresses and plotted in the stress-rupture diagram.



High Temperature Mechanical Properties of Pt DPH

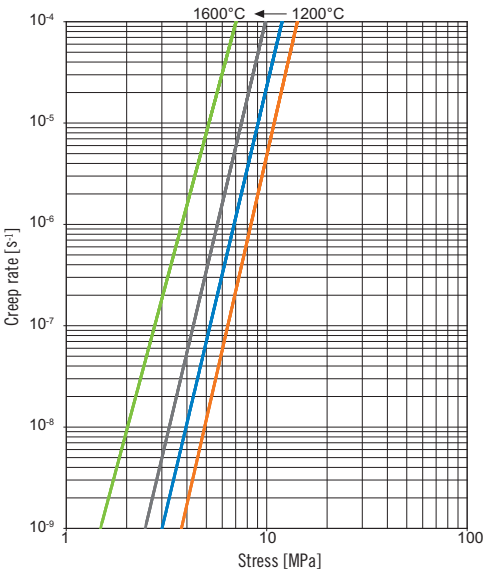
Standard values are needed to permit the comparison of different materials. The table summarizes the results of tensile and stress-rupture tests. The stress-rupture strength is shown for a life of 10,000 h, i.e. almost 14 months. The creep strength corresponds to a creep rate of about 3% per year.

		1200°C	1300°C	1400°C	1600°C
R_m	[MPa]	25.0	19.8	15.6	10.4
$R_{p0.2}$	[MPa]	18.5	15.1	13.6	9.8
A	[%]	68	62	53	45
$R_{m/10,000h}$	[MPa]	3.3	2.9	2.5	1.3
$\sigma_{1.0E-09}$	[MPa]	3.8	3.0	2.4	1.5

R_m	Tensile strength
$R_{p0.2}$	Yield strength
A	Tensile elongation
$R_{m/10,000h}$	10,000 h stress-rupture strength
$\sigma_{1.0E-09}$	Stress for creep rate 10^{-9} s^{-1}

Creep Strength of Pt DPH

During the stress-rupture test, the creep rate of each specimen is determined and plotted for each temperature as a function of the applied stress.



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