

Thermal mirror

To carry out thermal analysis of systems containing mirrors, you may need to use an extra dummy surface in contact with the mirror to accommodate TCE data. If you insert a REFLECT surface in a system, the TCE of the surface will be used for both the mirror radius and spacer. If the two are made from different materials, you need to use an extra surface.

Consider the following 100 mm focal length single-mirror system. If you enter the system as shown and list the refractive indices, you see that the TCE of the mirror is 0, so nothing will change when the temperature is changed.

```
*LENS DATA
Thermal Mirror Example
SRF      RADIUS      THICKNESS  APERTURE RADIUS    GLASS  SPE  NOTE
OBJ      --          1.0000e+20  1.0000e+14         AIR
AST -200.000000    -100.000000  50.000000 AS      REFLECT
IMS      --          --          1.0000e-04 S

*PARAXIAL CONSTANTS
Effective focal length: -100.000000    Lateral magnification: -1.0000e-18

*CONDITIONS: GENERAL
Temperature:          20.000000    Pressure:          1.000000
```

Now suppose that you have a mirror made from BK7 glass (TCE = 7.1e-6), mounted in an aluminum tube (TCE = 23.6e-6). The proper way to set this up is the following:

```
*LENS DATA
Thermal Mirror Example
SRF      RADIUS      THICKNESS  APERTURE RADIUS    GLASS  SPE  NOTE
OBJ      --          1.0000e+20  1.0000e+14         AIR
AST -200.000000    --          50.000000 AS      REFLECT
2 -200.000000 P -100.000000  50.000000 S      AIR
IMS      --          --          1.0000e-04 S

*PARAXIAL CONSTANTS
Effective focal length: -100.000000    Lateral magnification: -1.0000e-18

*CONDITIONS: GENERAL
Temperature:          20.000000    Pressure:          1.000000
```

Now if you change the temperature to 100, you will have the following system. Note that the dummy surface has shifted by .0002 microns, due to round-off error in the calculations.

```
*LENS DATA
Thermal Mirror Example
SRF      RADIUS      THICKNESS  APERTURE RADIUS    GLASS  SPE  NOTE
OBJ      --          1.0000e+20  1.0000e+14         AIR
AST -200.113600    -2.1149e-06  50.028400 AS      REFLECT
2 -200.113600 P -100.176810  50.028399 S      AIR
IMS      --          --          0.060106 S

*PARAXIAL CONSTANTS
Effective focal length: -100.056800    Lateral magnification: -1.0006e-18

*CONDITIONS: GENERAL
Temperature:          100.000000    Pressure:          1.000000
```