By design a coiled filament of tungsten is placed in a clear quartz tube which is filled with a halogen gas.

The tungsten filament operates in the range of 2200 deg C and emits infrared in the range of 0.76 to 2 microns.

Tungsten has a tendency to evaporate when the lamp is in use. This can cause a loss in the shortwave output. The halogen present in the tube combines with the evaporated Tungsten particles to form a Tungsten halide. The high temperature of the filament causes the tungsten halide to break down into tungsten and halogen. The tungsten gets deposited on to the filament and the halogen is released to repeat this cycle.

The halogen cycle describes a complex chemical interaction between tungsten, oxygen and a halide that makes tungsten halogen lamps possible. The material that evaporates from the hot filament builds up on the inner bulb-wall and darkens the lamp. This "lamp blackening" becomes even more severe when the filament is situated near the bulb-wall, as in thin tubular lamps. The halogen cycle prevents lamp blackening and extends the service life of the bulb.

The cycle works as follows -

1: Tungsten atoms evaporate from the hot filament and diffuse toward the cooler bulb wall. The filament temperature is about 3030º Celsius (or about 5480º Fahrenheit). The temperature at the bulb wall is about 730º C (or about 1340º F).

2: Tungsten, oxygen and halogen atoms combine on or near the bulb-wall to form tungsten oxyhalide molecules. Bromine is now the most common halogen. Chlorine is used in some special photocopying lamps that operate only for brief intervals.

3: Tungsten oxyhalides remain in a vapour phase at the bulb-wall temperatures and this vapour moves toward the hot filament. A combination of diffusion and convection currents are responsible for the movement.

4: High temperatures near the filament break the tungsten oxyhalide molecules apart. The oxygen and halogen atoms move back toward the bulb wall and the tungsten atoms are re-deposited on the filament. The cycle then repeats.