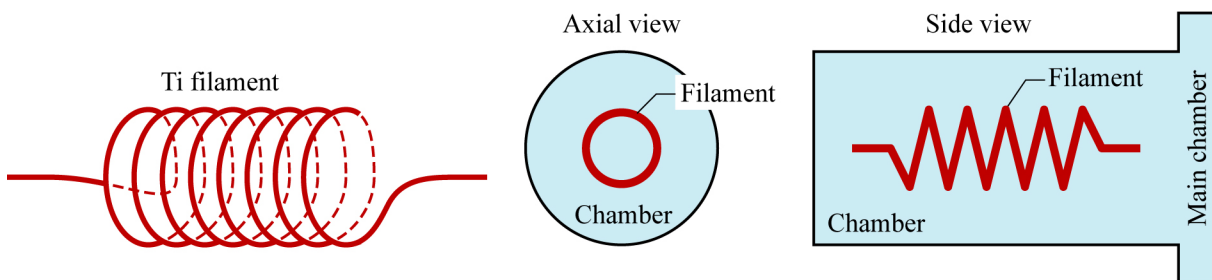


Ti sublimation pump

- Also called “Ti Getter Pump”
- What is sublimation? A transition from solid to gaseous without an intermediate liquid state.
- What is a getter? A material that binds unwanted gases or impurities.
- Dictionary definition of the noun “getter”: A substance introduced into a vacuum tube or electric lamp to remove traces of gas.
- Getter metals include tantalum, columbium, zirconium, thorium, titanium, aluminum, magnesium, and barium.
- Have you ever seen the getter in a vacuum tube? The getter is the silvery substance that can be seen from the outside of the tube.
- What is the getter material in a vacuum tube? The active ingredient of most getters in vacuum tubes is barium, which is used in combination with aluminum, magnesium, tantalum, thorium, strontium or calcium.



- Figure below shows the schematic of a Ti sublimation pump.



- How does a Ti sublimation pump work? The Ti filament is heated by an electrical current so that the Ti sublimates. A thin Ti film deposits on the walls of the pump chamber. The Ti chemically binds residual gases, for example, oxygen and water vapor, thereby lowering the pressure of the chamber.
- Photograph below shows Ti filament of a sublimation pump (product of Varian Corp.).



- What is the pressure range for a Ti sublimation pump? Generally ultra-low pressures, i.e. $< 10^{-7}$ Torr.
- Why is a Ti sublimation pump not suited for high pressures? Pumping speed is inherently low.
- **Exercise:** Observe the getter action of Ti in the electron-beam evaporator. When increasing the electron-beam current and Ti starts to evaporate, the pressure suddenly drops by one order of magnitude or more.
- **Note:** When evaporating Ti, wait until the pressure has dropped before opening the sample shutter. Why? Because the initial flow of Ti contains many contaminants or “crud”.