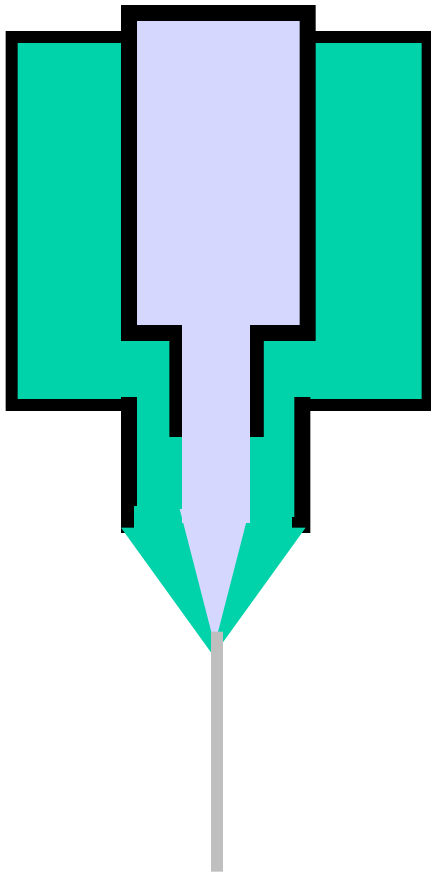




# Optical Transmission Media: Optical Fiber

# OPTICAL FIBER FABRICATION



- Molten core glasses in two vessels
- Molten mixture pulled into fiber



## **2-STAGE PROCESS: FABRICATE PREFORM, DRAW FIBER**

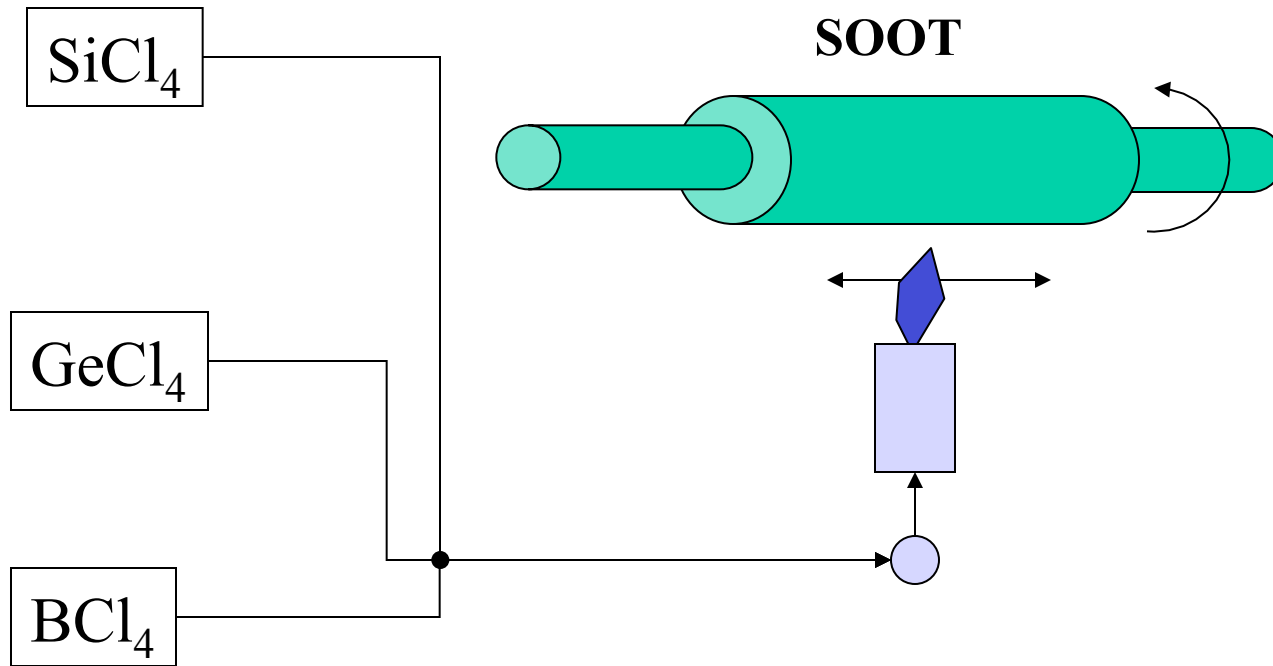
- **Rod of core glass**
- **Tube of cladding glass**
- **Fused together**
- **Interface critical**

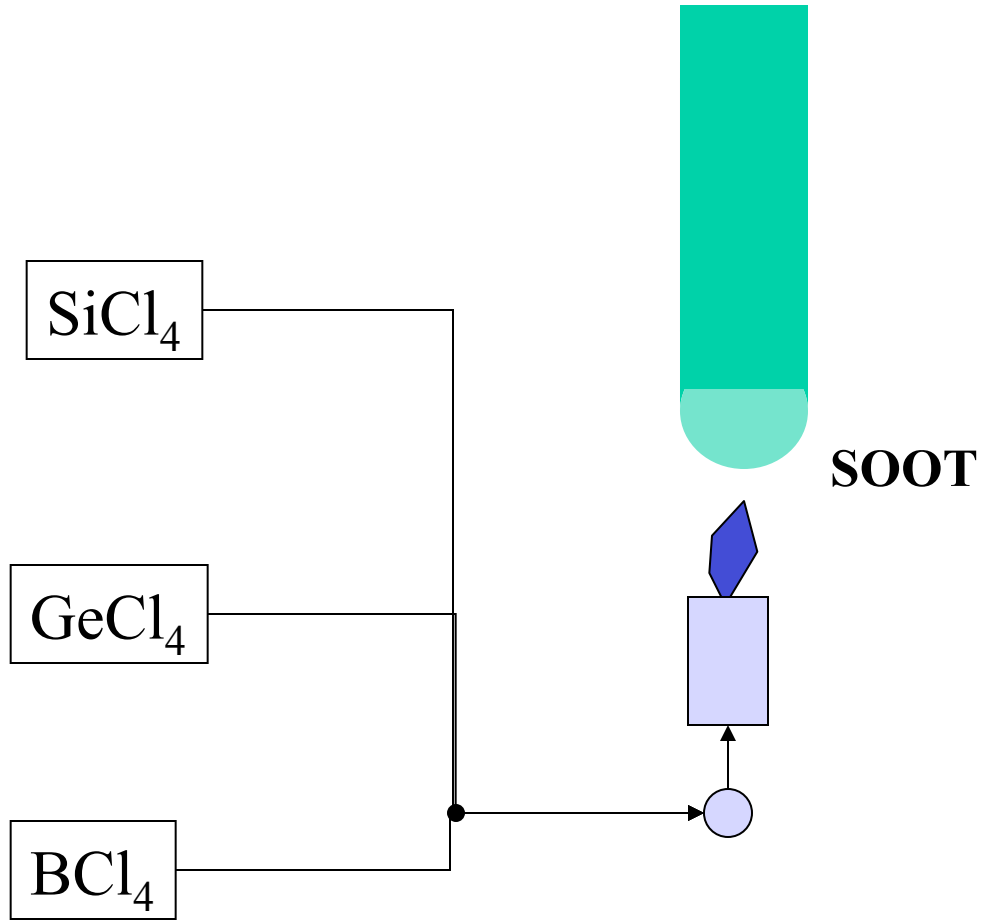


- **VAD (vapor axial deposition)**
- **OVD (outer vapor deposition)**
- **MOCVD (modified CVD)**

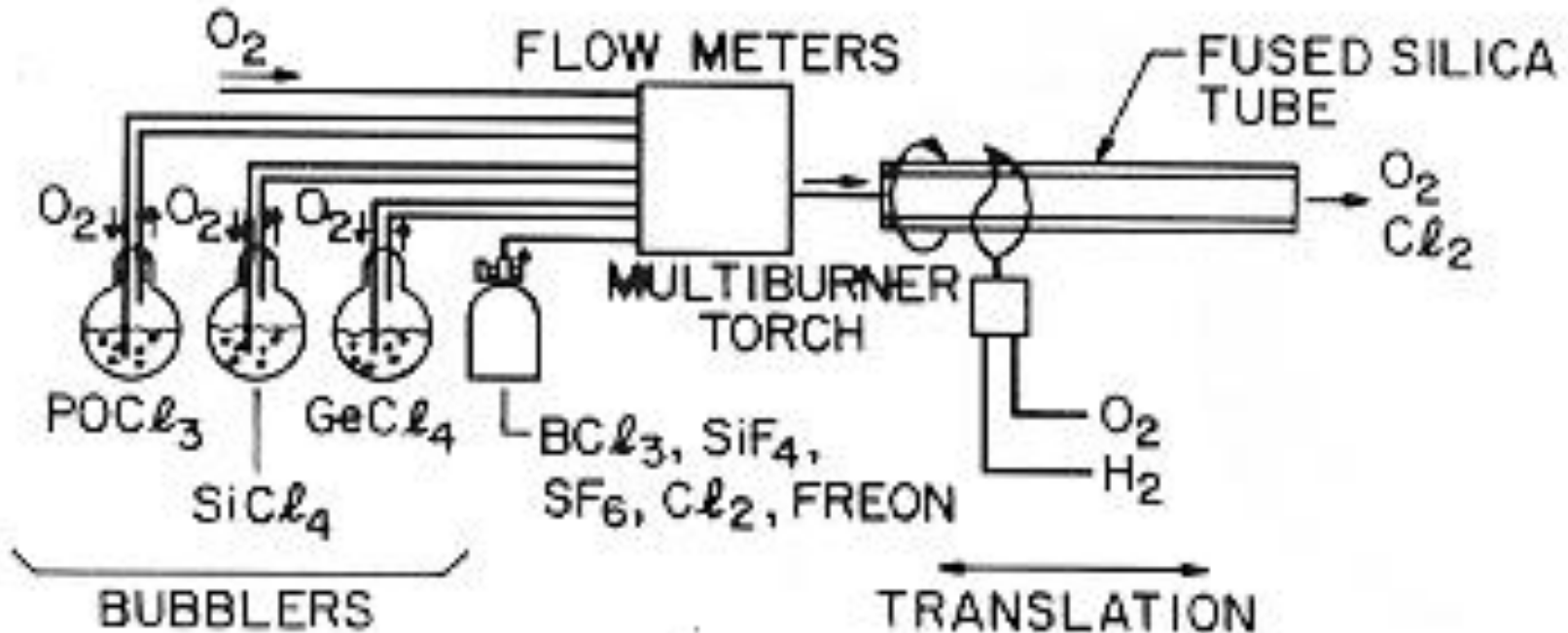


- Hydrolysis (OVD and VAD)
  - $\text{SiCl}_4 + 2\text{H}_2\text{O} = \text{SiO}_2 + 4\text{HCl}$
- Oxidation (MCVD)
  - $\text{SiCl}_4 + \text{O}_2 = \text{SiO}_2 + 2 \text{Cl}_2$
- Sol-Gel
  - sol: fumed silica in aqueous solution
  - spin sol, cast into tube-shape
  - gelled tube heat treated, sintered



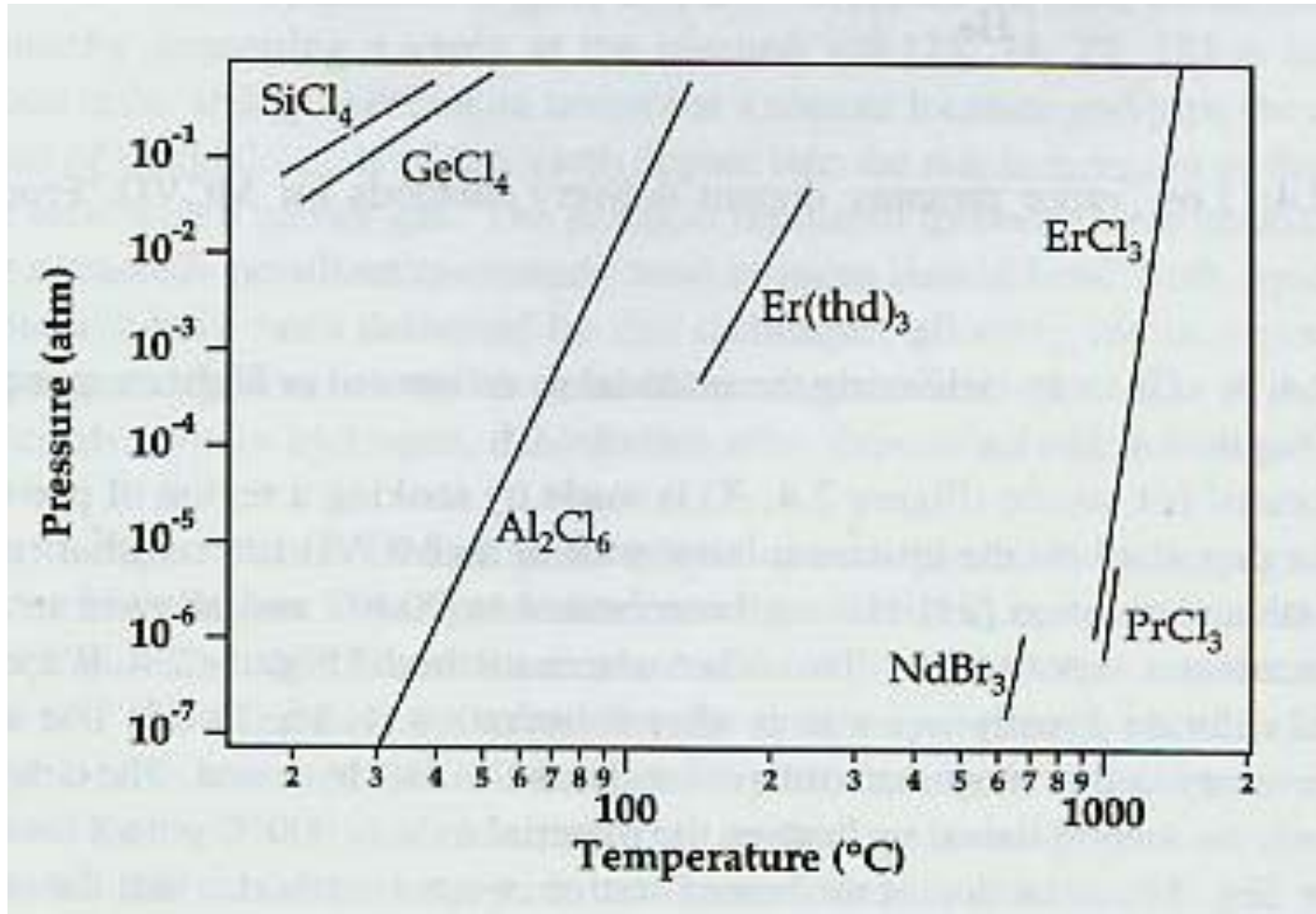


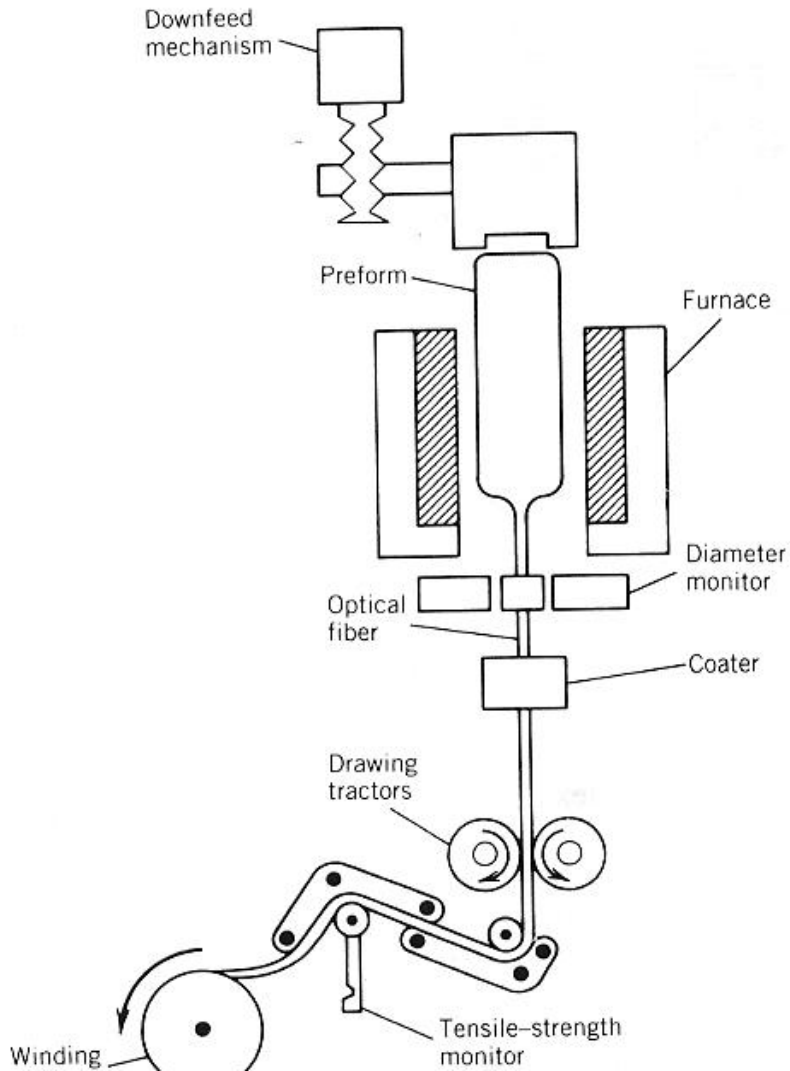




- Oxidation at 1800 °C
- Successive layers of glass inside tube
- Core last layer
- Gas flow rate determines dopant concentration

# Reactant Halides

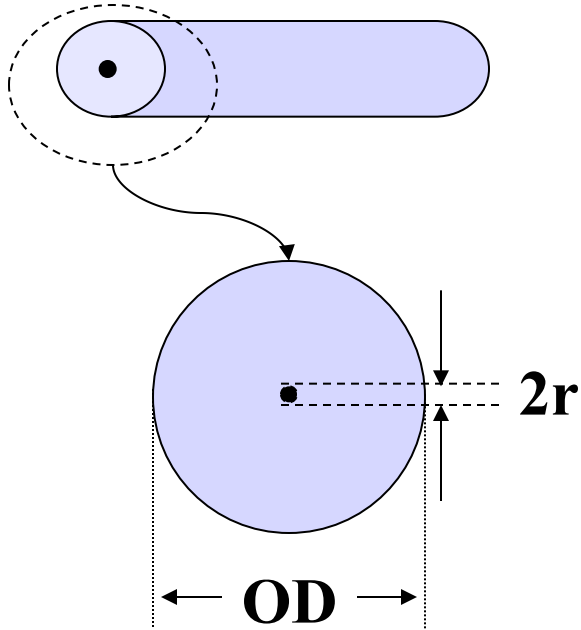




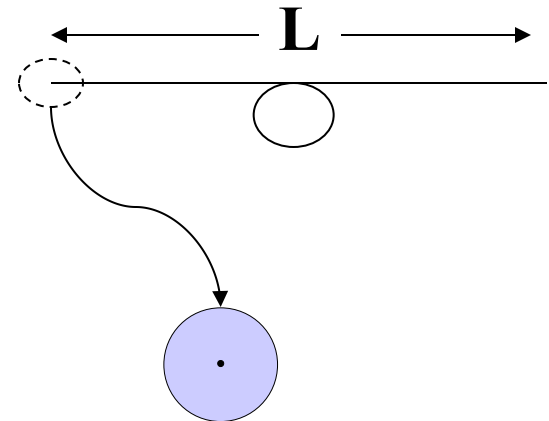
- **Draw tower classifications (height and temperature)**
- **Graphite furnace at 2k°C**
- **Preform dimensions ~ 1 m x 20 mm**
- **0.1% control of fiber diameter**
- **Coating: moisture and abrasion**



**Preform**



**Fiber**



$$V = \pi r^2 L = \text{constant}$$
$$\text{core/OD} = \text{constant}$$



- **Dispersion: pulse broadening**
- **Attenuation: loss**

**Power loss ultimately determines max distance**