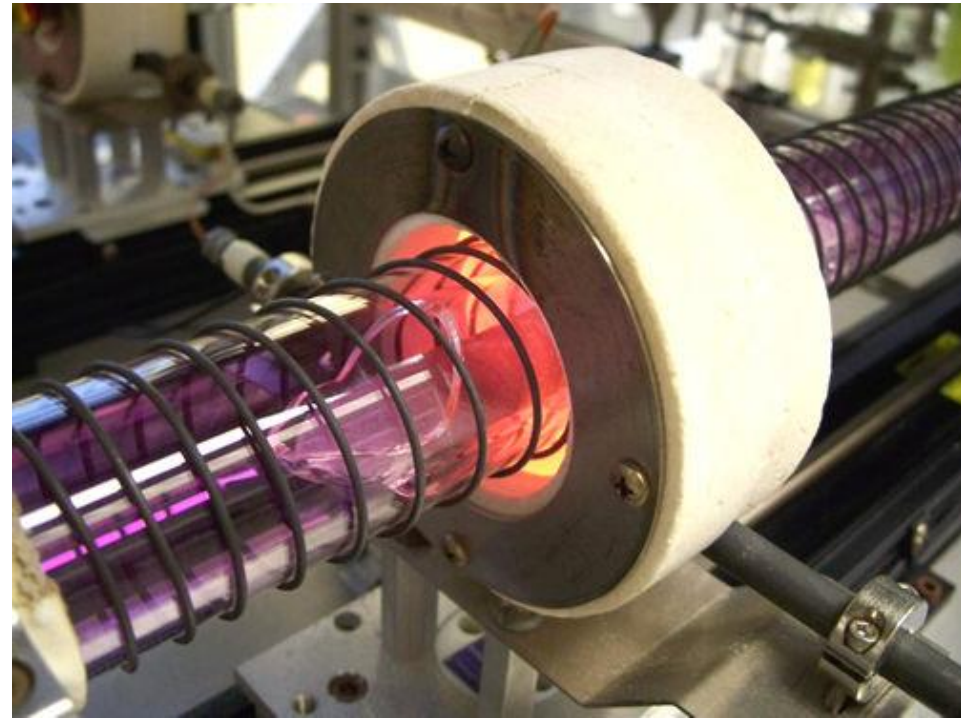
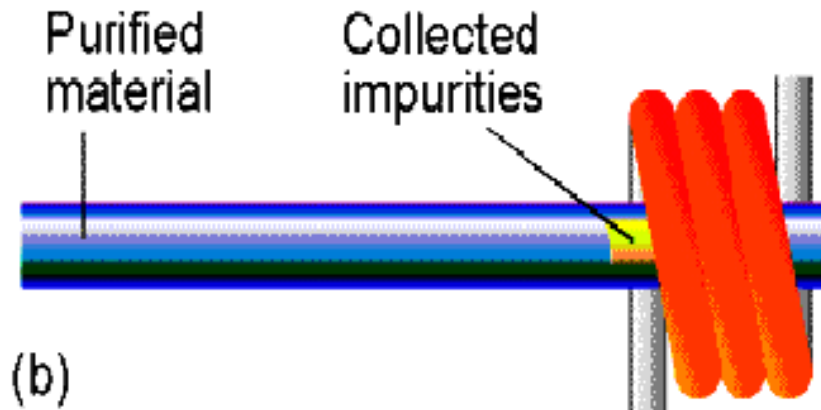
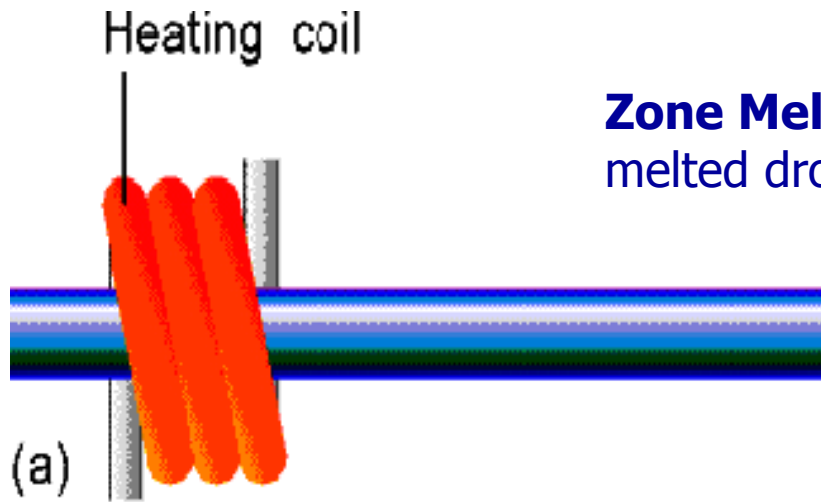


## production of EG-Si monocrystals



## Zone Melting (1952)

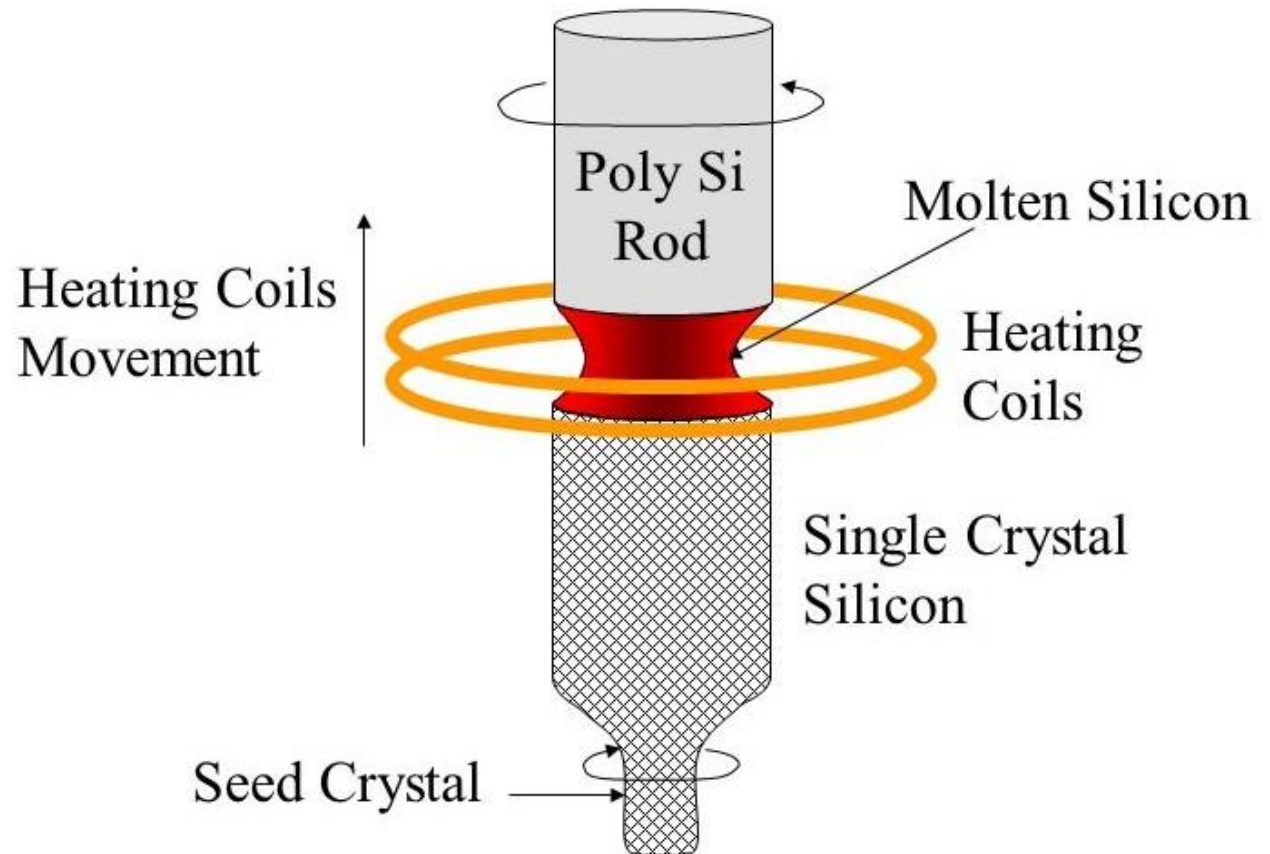
melted drop is moved along a crystal

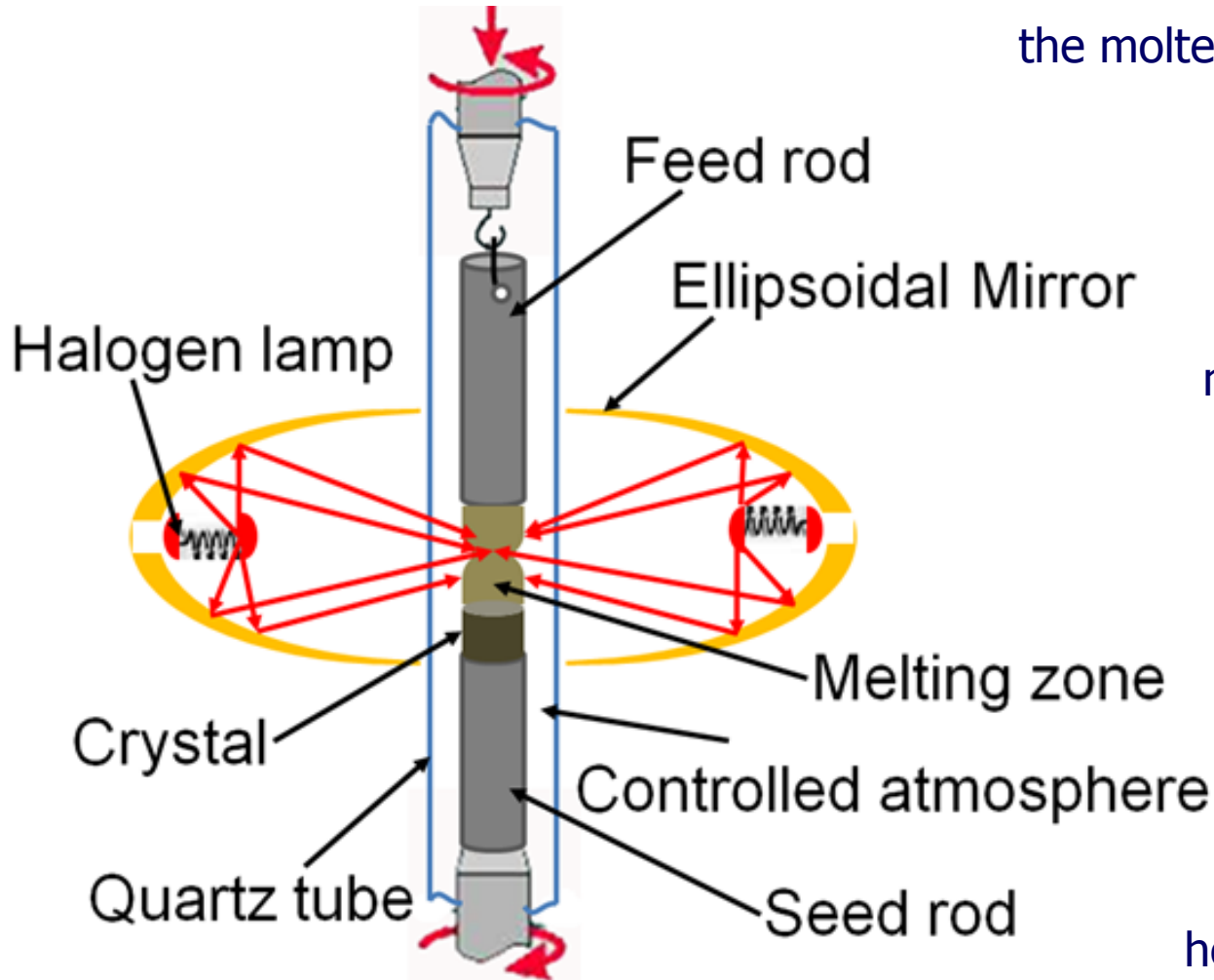




## Floating Zone (FZ) 1953

- molten drop is moved along a crystal vertically
- surface tension holds the drop





the molten zone is moved **upwards**  
or **downwards**

move **rate**  $\sim 3 \text{ mm/min}$

**Ar flow** (or vacuum)

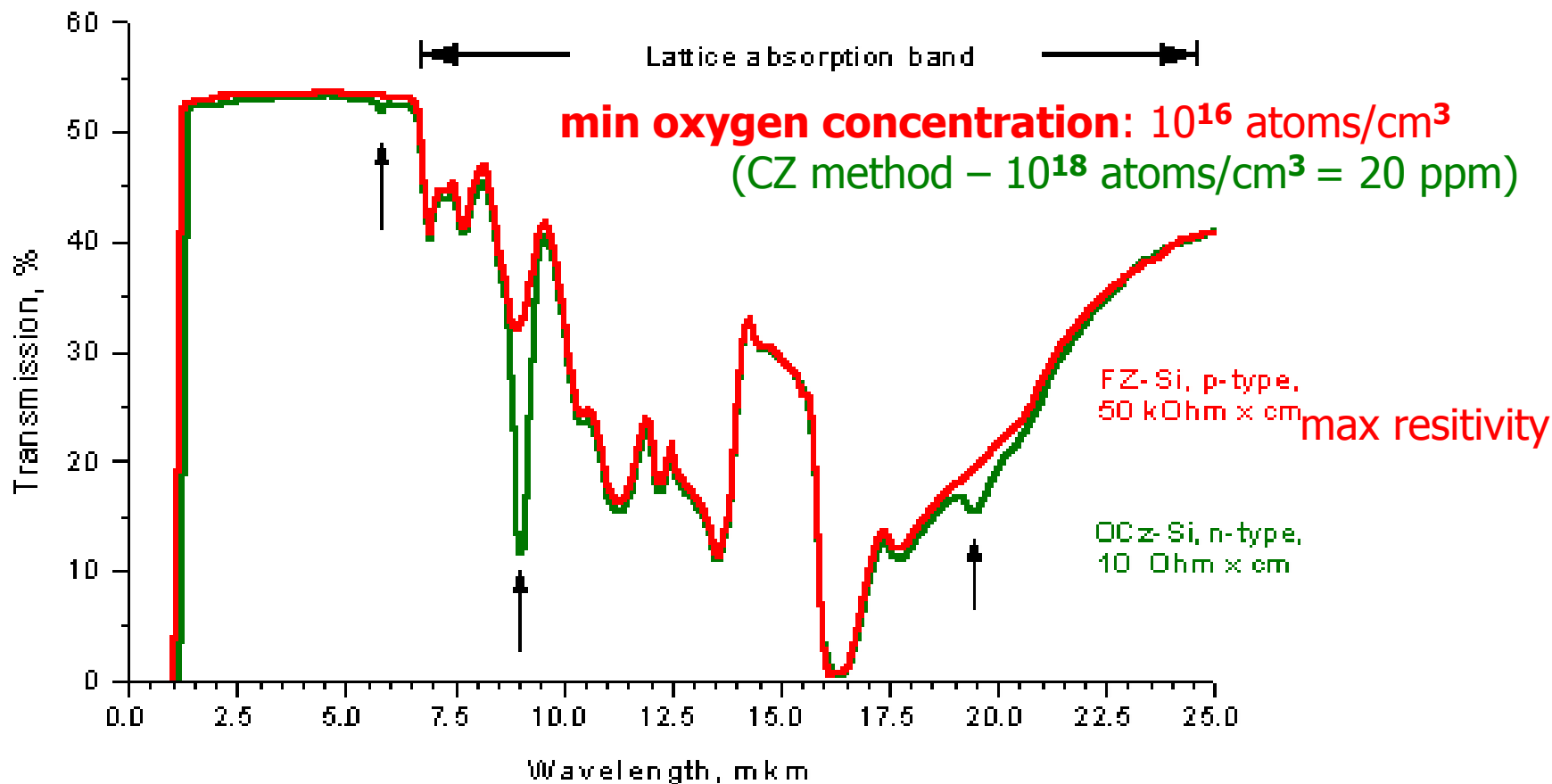
rotation:  $13\text{-}16 \text{ min}^{-1}$

heating:

- **infrared**
- electromagnetic (2 MHz)

## FZ advantages:

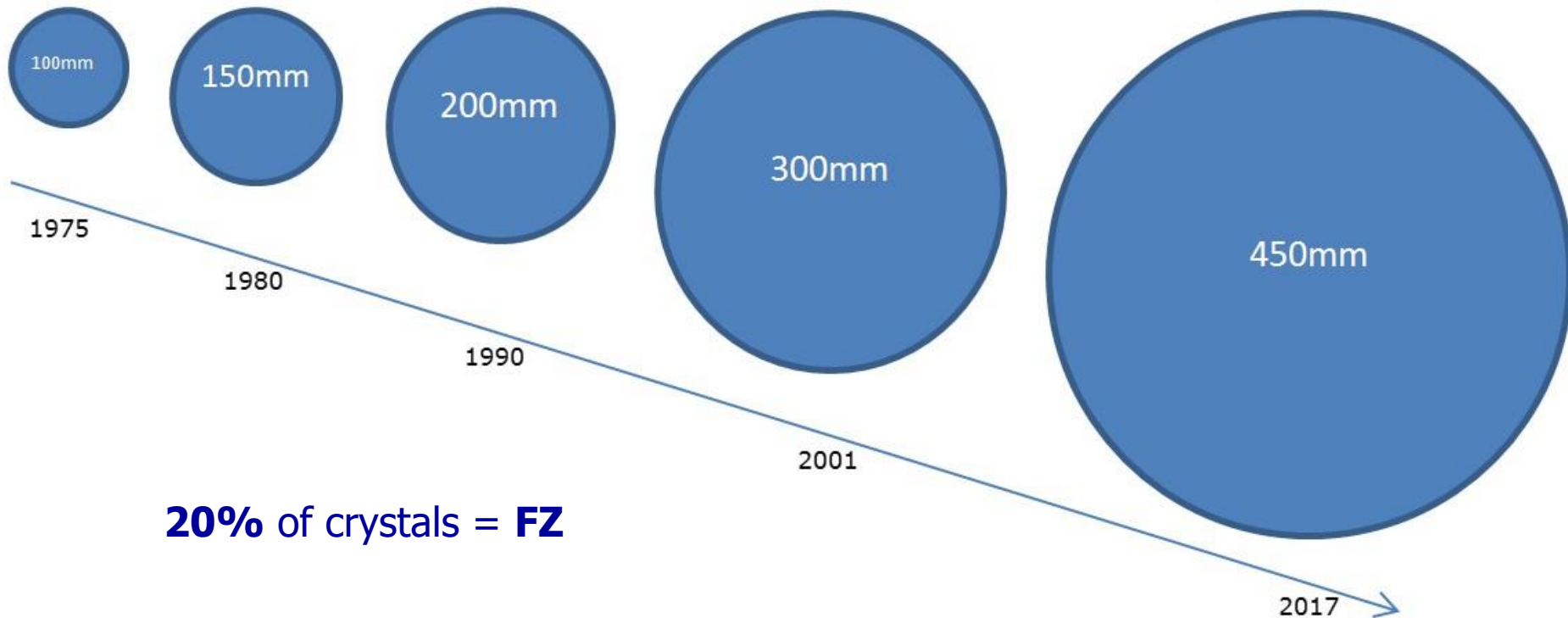
- **no crucible** → **high purity**
- **small molten drop** → **uniform doping level**



**FZ** → energy-efficient processors, hi power transistors,

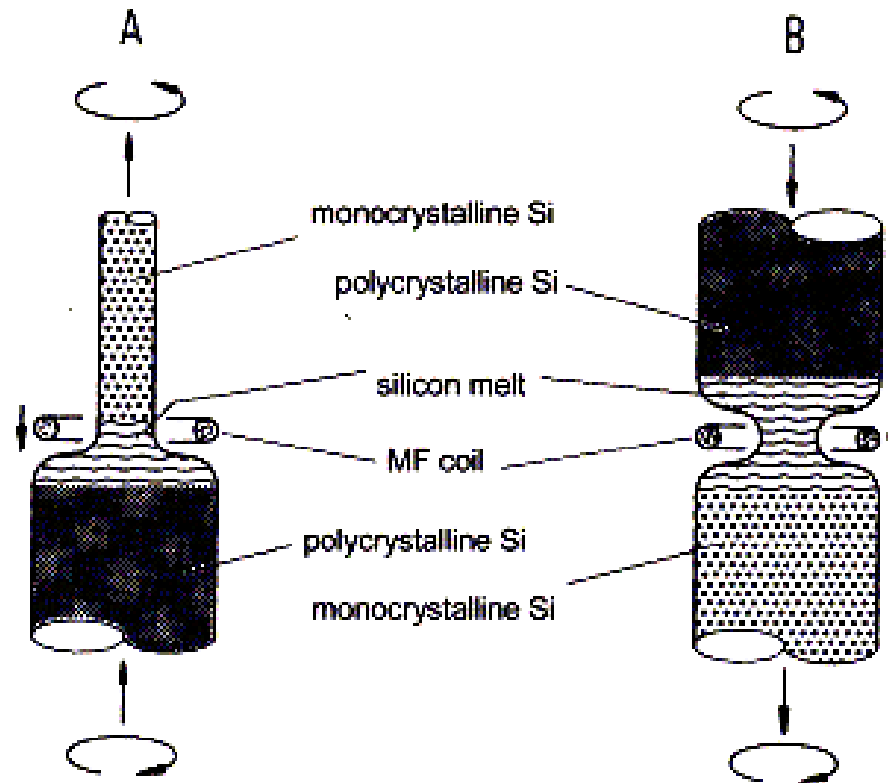
## FZ disadvantage = restricted diameter

larger diameter → lesser production cost per chip (~30%)



**20%** of crystals = **FZ**

**diameter** of the molten drop  $\sim 20$  mm



**improved FZ**  $\rightarrow$  diameter up to **150 mm**  
(**CZ** – 450 mm)