

# **Sample introduction techniques in AAS, AFS**

## **and Flame spectrometry**

**Nebulizers** are used to introduced sample into flame. **Following Nebulization** techniques are used for solid and liquid samples.

### **Solutions**

- Pneumatic nebulization
- Ultrasound nebulization
- Electrothermal vaporization
- Hydride generation

### **Solids**

- Electrothermal vaporization
- Direct insertion
- Laser ablation
- Spark or arc ablation

## **Nebulization:**

Nebulization is conversion of a sample to a fine mist of finely divided droplets using a jet of compressed gas.

- The flow carries the sample into the atomization region.

Method	Type of Sample
Pneumatic nebulization	Solution or slurry
Ultrasonic nebulization	Solution
Electrothermal vaporization	Solid, liquid, solution
Hydride generation	Solution of certain elements
Direct insertion	Solid, powder
Laser ablation	Solid, metal
Spark or arc ablation	Conducting solid
Glow discharge sputtering	Conducting solid

**Fig Different Nebulization methods**

Some nebulizers are discussed below:

### **1) Pneumatic Nebulizers (most common)**

In this nebulizer, the liquid sample is sucked through a capillary tube by a high pressure jet of gas flowing around the tip of the capillary as shown in figure.

### **2) Cross-flow Nebulizers:**

The jet stream flows at right angles to the capillary tip. The sample is sometimes pumped through the capillary.

### **3) Babington Nebulizers:**

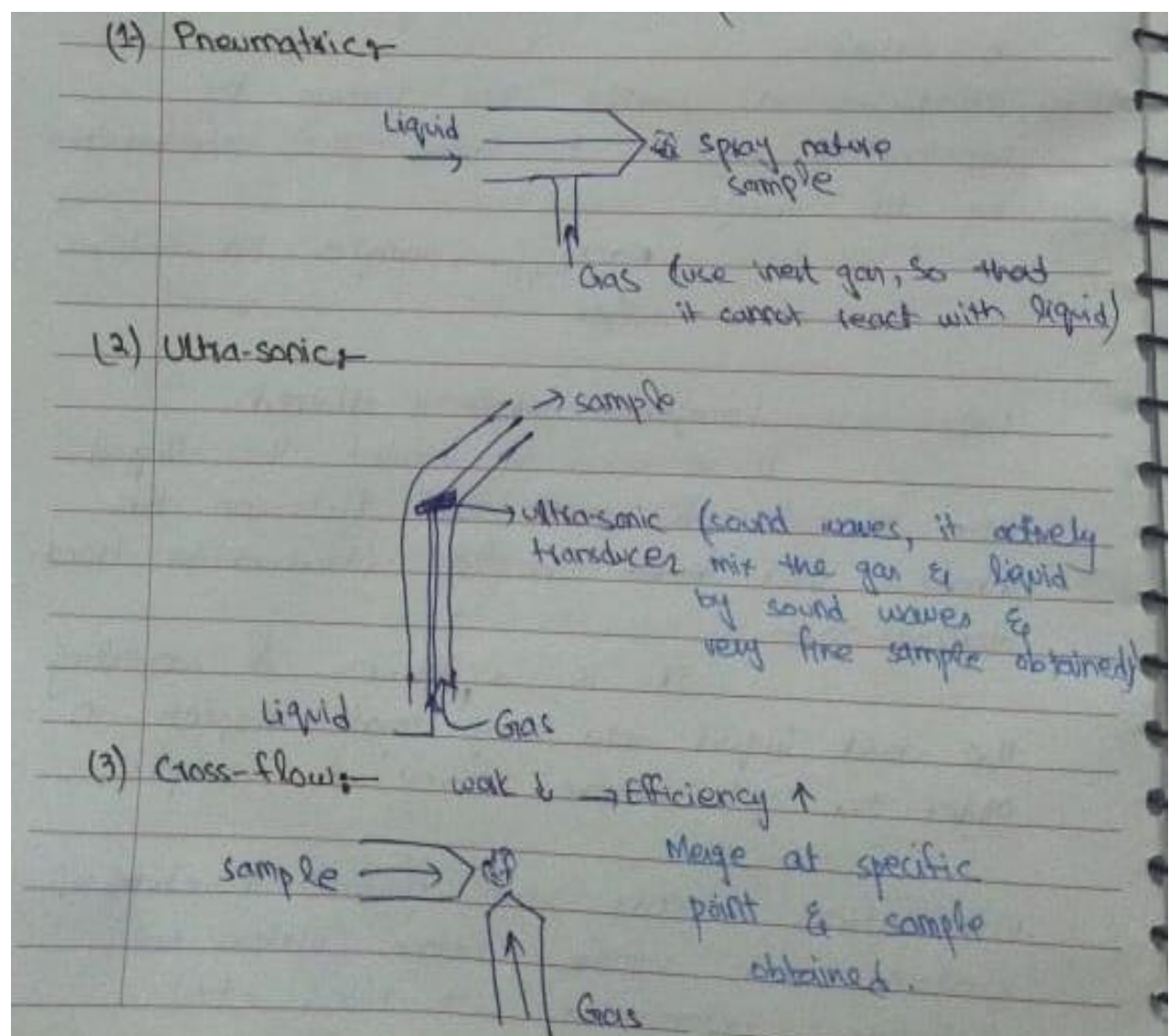
Jet is pumped through a small orifice in a sphere on which a thin film of sample flows. This type is less prone to clogging and used for high salt content samples.

#### 4) Ultrasonic Nebulizers:

- The sample is pumped onto the surface of a vibrating piezoelectric crystal.
- The resulting mist is denser and more homogeneous than pneumatic nebulizers.

#### 5) Electro-thermal Vaporizers (Etv):

An electro thermal vaporizer contains an evaporator in a closed chamber through which an inert gas carries the vaporized sample into the atomizer.



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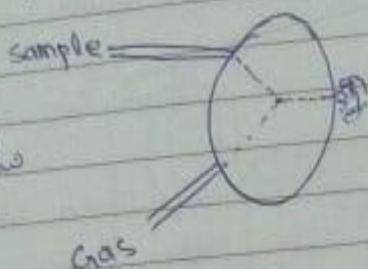
but V-series is used.

#### (4) Babington / V-Groove Nebulizers

Speciality:-

- (1) Very viscous sample can be used
- (a) contaminated samples can be used.

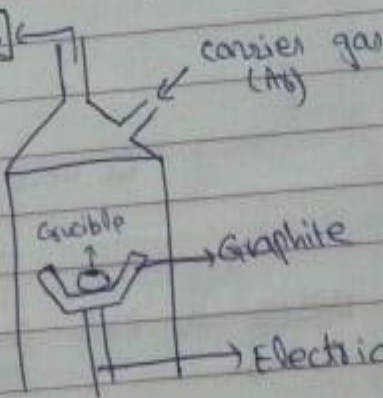
extra effect →  
Efficiency   
 ~~more~~ less than   
 class flow



It is in circular form. Heavy substance or contaminated things remain in the bottom of circle. & sample moves with the gas.

Liquids can be used. In liquids, solvent is present in large amount. After passing through the nebulizer, it passes through the vaporizer then pass through the atomizer. then it pass through it to evaporate extra water.

Vaporization Chamber / Furnace



Remove extra (solvent) water by vaporization. Sample is placed in the crucible. Electric source is applied & extra water evaporate and bit dense sample is obtained.