# Experiment 1-Y

**Objective:** To observe and learn the process of Sputtering deposition in the laboratory.

**Theory:** Sputtering stands as a foundational technique in microfabrication, playing a critical role in the deposition of thin films onto substrates. In this process, high-energy ions bombard a target material, dislodging atoms or molecules that then uniformly settle on the substrate's surface. This enables the creation of thin layers with controlled thickness and composition, vital for manufacturing semiconductors, solar cells, and other microelectronic devices. Sputtering ensures precise material placement, excellent adhesion, and enhanced film properties, offering versatility in depositing various materials. As microfabrication demands ever-smaller and more intricate components, sputtering remains indispensable for achieving the precise coatings essential to advanced technology.

**Materials used:**

• Sputtering system • Target material • Silicon wafer samples • Power supply

• Gas supply

**Procedure:**

• Ensure that the sputtering chamber is clean and free of contaminants. Pump down the chamber to achieve the desired vacuum level, typically in the range of $10^{-6}$ to $10^{-7}$ Torr.

• Load the target material into the sputtering system, ensuring proper alignment with the substrate holder.

• Place the substrates on the substrate holder, maintaining the desired distance from the target.

• Introduce the working gas (e.g., argon) into the chamber to create a plasma when energized by the power supply.

• Apply power to the target material to induce sputtering. The high-voltage discharge ionizes the gas, and the resulting ions bombard the target, dislodging atoms.

• The sputtered atoms travel in the vacuum chamber and deposit onto the substrates, forming a thin film. Result: So, we observed and learned the sputtering process.

**Observation:**

| Target material | Substrate | Deposition thickness | Deposition rate | Time | Working pressure |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

**Other parameters involving the process:** These parameters will be shown during the process.

**Result:**