Vanadium Oxides are compounds that go through reversible metal-to-semiconductor transitions [Figure 1]. Vanadium Dioxide (VO₂) is the most commonly studied Vanadium Oxide because it has the lowest transition temperature at around 68°C. Above the transition temperature VO₂ behaves as a metal and below the transition temperature VO₂ behaves as a semiconductor. In this work VO₂ will be made by Physical Vapor Deposition (PVD) [Figure 2]. PVD is a process that uses a target (Vanadium) and a carrier gas (Argon) to apply a thin metallic coating to a substrate (doped Silicon wafers). This exact process has not been used to make VO₂ before. Tests have to be performed on each sample to confirm that VO₂ was coated on the substrate and not another form of a Vanadium Oxide.

The first Vanadium Oxide on a Silicon wafer sample was made by PVD. But the SEM/EDS analysis of the film indicated that VO₂ was probably not formed. A vanadium bond layer was used to help with adhesion to the non-conductive wafer and there was a thin coating of Vanadium Oxide. Unfortunately the layer was too thin to give an accurate stoichiometric value.

The next Vanadium Oxide coating was done on a conductive Silicon wafer doped with Arsenic. Compared to the previous test, the Oxygen flow rate was increased from 2.3 sccm (standard cubic centimeters per minute) to 3.6 sccm. When SEM/EDS was used to determine the sample stoichiometry, there was double, by Atomic %, the amount of Oxygen on the coating than there was Vanadium [Figure 8]. XRD was performed and the results indicated that the film was either too thin or the coating was amorphous. Another sample was heat treated, XRD was performed and the results were again inconclusive meaning that the coating layer was probably too thin.

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