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TA: Roman

Silicon Wafer Characterization

Four-Point Probe

The goal of this station was to determine the resistivity of a silicon wafer using the Four-Point probe and the particular wafer. The influences of light, temperature and surface finish are included. The Four-Point method is used to avoid contact resistance which can often be the same magnitude as the sheet resistance. Typically, a constant current is applied to two probes and the potential on the other two probes is measured with a high impedance voltmeter. The advantage of 4-terminal sensing is that the separation of the current and the voltage electrodes eliminates the impedance contribution of the wiring and contact resistance.

Conductivity determination

Conductivity determination is a method that is used in the determination of which type a silicon wafer is. This process is a destructive process, meaning that the silicon wafer would no longer be usable after conduction. The thermoelectric probes, when applied to the wafer, would show whether a wafer was n-type (extra concentration of doped electrons) or p-type (extra concentration of doped holes) based upon the conductivity of the wafer. The galvanometer attached to the probes would have a needle that would move towards the right if the sample was n-type or to the left if the sample was p-type.

Crystal Orientation determination

This process is used in order to obtain the optical orientation patterns of a semiconductor wafer. There are three different kinds of optical orientation, which are 100, 111, and 110. The process for this process is as follows.

- Process:
 - Set up the equipment
 - Using the tweezers, grab as little of the wafer as possible at a corner or side while having a solid grip of the the sample
 - There are two sides to the wafer, a polished and a not polished side. Take the non-polished side and hold it against the aperture of light and the reflection off the surface of the wafer against the wall will display a pattern of light.
 - This pattern of light is indicative of the Miller Index of the wafer, which is listed next to the potential patterns of light (111, 100, etc.).