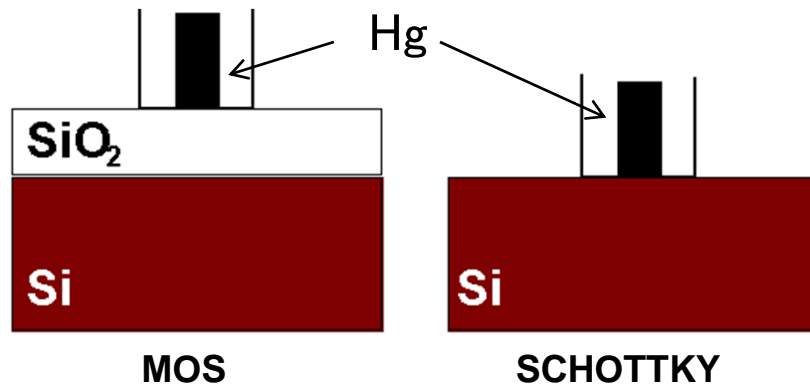


## Electrical Characterisation of materials by Mercury Probe Capacitance Voltage Measurement (MCV)

### 1. Experimental



Electrical properties of semiconductors or dielectrics (Low-k, High-k materials) in MOS devices can be characterized by MCV without electrode deposition.

### 2. Applications and characteristics

#### Application

- Determining of Oxide Charge (VFB)
- Interface traps measurement (Dit)
- Resistivity profiling ( $\rho$ )
- Carrier density profiling (PID)
- Carrier life time measurement ( $\tau_g$ )
- Permittivity / Relative dielectric condtant ( $\epsilon$ / k-value)
- Dielectric integrity and reliability (TZDB, TDDB)

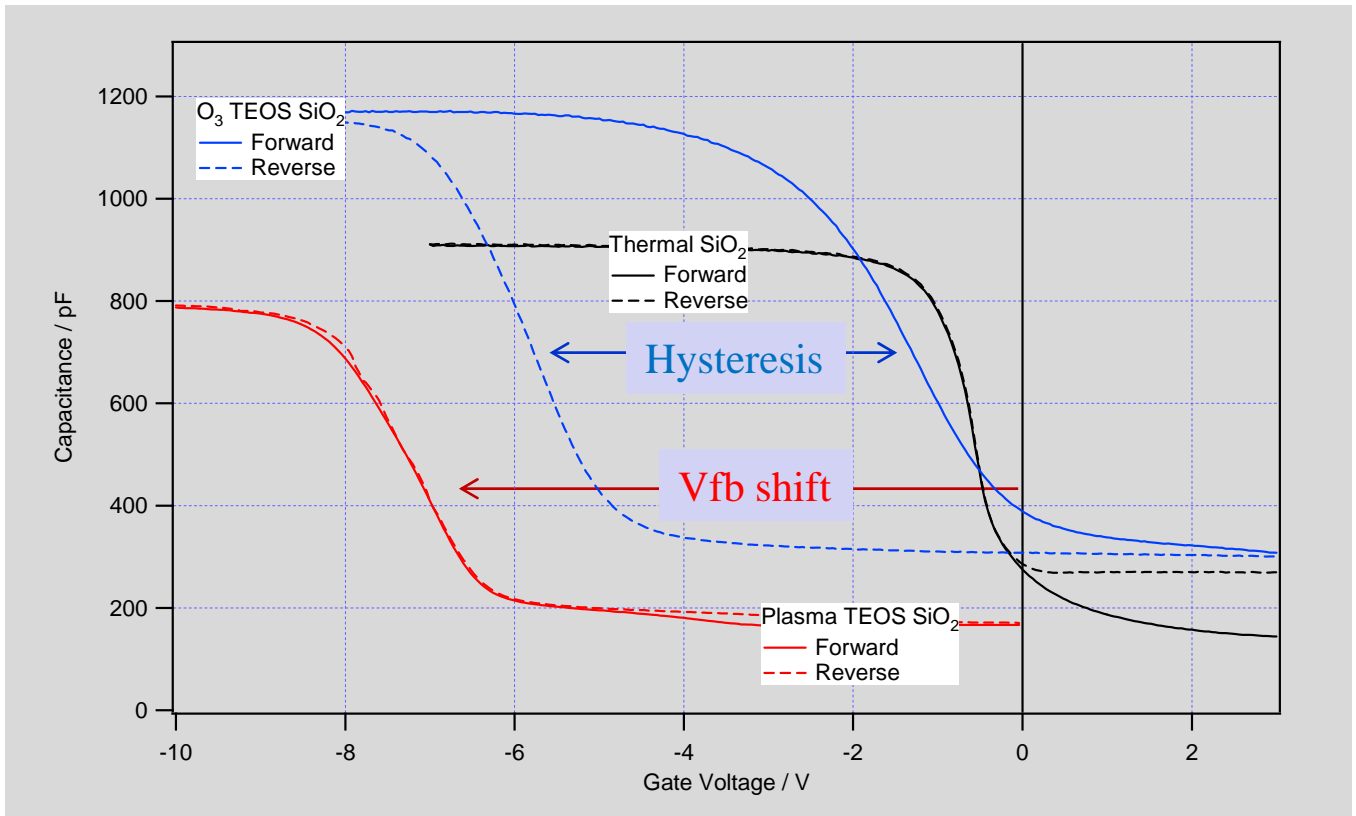
#### Characteristics

- Electrode deposition have no use due to Mercury Probe System.
- Good precision  
SCHOTTKY :0. 3% (1 $\sigma$ )  
MOS :0. 1% (1 $\sigma$ )
- Good precision and sensitivity
- Mapping data of wafer can be obtained.



### 3. Examples of CV measurement by Mercury Probe System

Typical C-V curves of SiO<sub>2</sub> film (50 nm thickness )



“Forward” indicates C-V curve obtained from the gate voltage swept from negative to positive whereas “Reverse” indicates that from positive to negative.

We can find the differences of film properties from C-V analysis.

(1) “Vfb shift” indicates that the plasma TEOS film has positive fixed charges.

(2) “Hysteresis” indicates that the O<sub>3</sub>-oxidized TEOS film has positive mobile charges (Na<sup>+</sup>, K<sup>+</sup>, Li<sup>+</sup>, etc.).

(3) The thermal oxidized SiO<sub>2</sub> film has good properties compared with other films.

