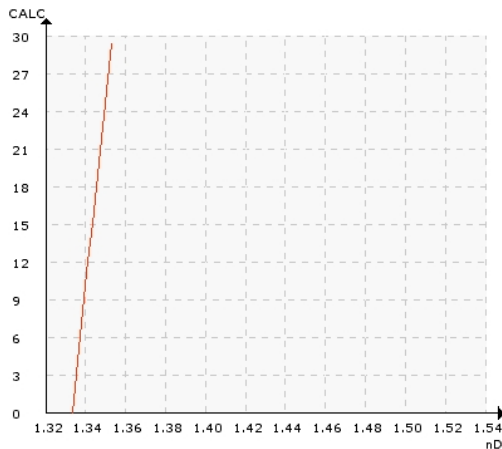


## BLENDING AND DISPENSE OF H<sub>2</sub>O<sub>2</sub> SLURRY

### Typical end products

Semiconductors, silicon wafers

### Refractive Index of Hydrogen peroxide H<sub>2</sub>O<sub>2</sub>:



### PROCESS

Chemical mechanical planarization (CMP) is the process of smoothing and polishing the wafer surface. This is done with the aid of an oxidising agent, e.g. Hydrogen peroxide H<sub>2</sub>O<sub>2</sub> that contains abrasive particles suspended in the carrier fluid. H<sub>2</sub>O<sub>2</sub> oxidizes the silicon wafer surface to silicon dioxide. The polishing pad is then capable of more efficiently polishing the wafer surface because the newly oxidized layer is much softer than the silica.

The CMP slurries require mixing or dilution before use. Oxide polishing slurries are commonly

purchased in concentrated form and diluted with water on-site to minimize shipping and labor costs, while some multi-component polishing slurries must be blended before use because of their short post mix lifetime. In both cases, it is essential to measure the H<sub>2</sub>O<sub>2</sub> concentration in the mixed slurry, because altering the concentration of the slurry constituents will affect the chemical reaction rates and wafer polishing rate. Too much H<sub>2</sub>O<sub>2</sub> can result in contamination of the wafer.

Process tools that drive the semiconductor manufacturing processes, like CMP are referred to as critical process systems, and are typically operated by a fab's facility management team. Automated chemical and slurry handling systems have tremendous implications to the safety, purity, and uptime of the fabrication processes.

### APPLICATION

A typical blending and distribution system is composed of blend stations working in conjunction to provide a continuous supply of slurry to multiple CMP polishers. K-Patents Semicon Refractometer PR-33-S is mounted as an in-line metrology device, which measures the H<sub>2</sub>O<sub>2</sub> content of the slurry during blending.


The system blends slurry, DI water and H<sub>2</sub>O<sub>2</sub> according to an adjustable recipe. The raw slurry is pumped from an online supply drum into the blending tank.

The slurry and other components are metered into the blend tank by weight and re-circulated in the blend loop until the mixture is homogenous. The blend must pass quality analysis before the slurry can be distributed to the day tank and/or CMP tools.

With a traditional in-line auto-titrator, it would take minutes up to an hour before a slurry mixture is accepted as a qualified slurry blend. Optimizing the blend recirculation timing by using K-Patents Refractometer will eliminate unnecessary delays between slurry blending steps. Also, the qualification step in determining the CMP slurry's H<sub>2</sub>O<sub>2</sub> concentration can be shortened without sacrificing the slurry quality.

**INSTALLATION**

K-Patents Semicon Refractometer can be installed in a circulation line at the slurry blending station and/or in the slurry dispense line. Typical H<sub>2</sub>O<sub>2</sub> concentration is 0-5% by weight and the process temperature is near to ambient. The sensor can be installed in a vertical or in a horizontal pipe line. The sensor should be mounted in the horizontal axis position, so that the interconnecting cable points downwards. K-Patents recommends a minimum flow velocity of 1.5m/s (5ft/s).

Instrumentation	Description
	<p><b>K-Patents Semicon Process Refractometer PR-33-S</b>            Installation in pipe with a Pillar or Flare connection            Measurement range: 0-100% by weight            Process temperature range: 0-85°C</p>
<p><b>Benefits</b></p>	<ul style="list-style-type: none"> <li>• Very high accuracy and absolute signal stability help to control the CMP chemical mixing, blending and dilution processes.</li> <li>• Real-time metrology that replaces timely grab sampling</li> <li>• Air bubbles do not affect the measurement.</li> <li>• Remote functionality over Ethernet facilitates viewing of instrument diagnostics and altering configuration settings without having to enter the cleanroom.</li> </ul>