

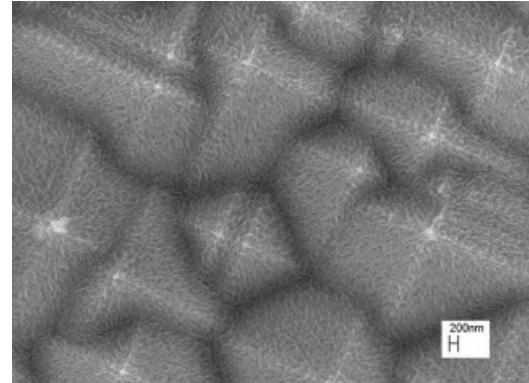


Subject: Wafer Texturing Etch Overview	Product: Sigma-5	Doc#: AO.MCD.10.015
Title: Texturing Etch		

Texturing Etch

Application Overview

Wafer Texturing Etch is an application used in the Photovoltaic/Solar industry. First, after being cut, wafers, are cleaned to remove unwanted particles or to repair damage caused during the sawing process. When used for solar cells, wafers are texture etched to create a rough surface. This process increases the efficiency of the solar cell by boosting its light absorption capability. The textured surface allows less light to be reflected from the material, thereby capturing more of it within the solar cell. Good texturing can increase cell efficiency up to 20 to 35%.



Silicon pyramid structures etched onto a wafer

Application Challenges:

- Precise positioning of the etching device.
- Repeatability to assure maximum efficiency
- Simple interface to PLC for easy transfer of servo data
- Simple programming for faster machine commissioning.

Yaskawa Products:

Product	Feature	Benefit
Sigma-5	SGDV Sigma-5 Servo amplifier frequency response of 1.6kHz	Faster settling times allow for higher performance of the servo system.
	20-bit absolute encoder standard on all Sigma-5 servomotors	Precise positioning and repeatability requirements can be met without increased cost to the user
MotionWorks IEC Software	IEC61131-3 Global Standard Programming Environment	Reduced learning curve and provided for faster machine commissioning. User libraries of pre-defined functions are easily incorporated into new projects, saving time and speeding the build cycle.
MP2000iec Controllers	EtherNet/IP Communications	Easy transfer of servo data to PLC

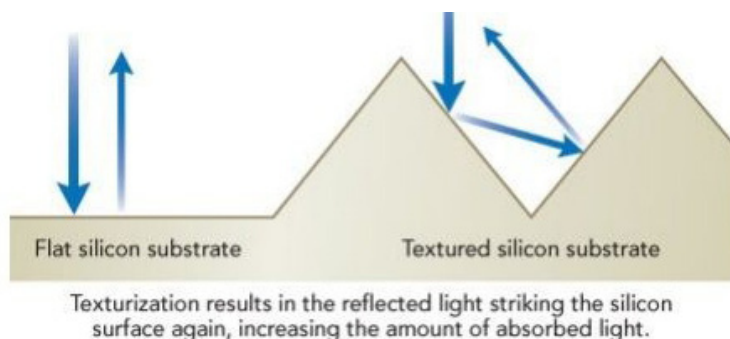




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Application Details:

Typically, a textured etching application attempts to etch small pyramid structures on the surface of the wafer. The diagram below shows how a textured silicon substrate compares with a flat one. The textured substrate allows less light to be reflected off of the surface of the substrate. It reflects more light back into the substrate. Therefore, more light is captured by the solar cells, allowing for more light to be processed into electrical energy.



An XYZ positioning application can be used to perform the textured etching onto the wafer. Yaskawa rotary or linear servomotors and servo amplifiers can be used to accomplish the texturing. Sigma-5 amplifiers perform with a 1.6 kHz frequency response. When fine tuned, they are capable of reducing settling times down to under 4ms. This allows for higher cycle times. All Sigma-5 servomotors feature a standard 20-bit absolute encoder. This provides greater positional precision and enhances repeatability, both keys for semiconductor and solar applications.

MP2000iec controllers with 100 Mbaud EtherNet/IP communications provides easy transfer of servo data to the PLC. Programming is also simplified with the use of MotionWorks IEC software. The IEC-61131-3 standard software with predefined PLCopen function blocks and user libraries saves time and speeds the build cycle for the programmer.

