



**Nines**  
**Photovoltaics**



9s ADE-100

**ATMOSPHERIC  
DRY ETCHING**

Enabling Innovations for  
the photovoltaic industry

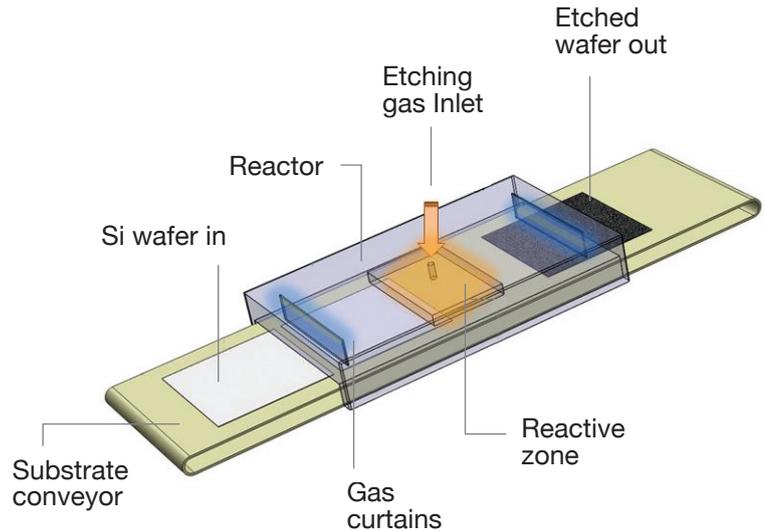
[www.nines-pv.com](http://www.nines-pv.com)

# PRODUCTS

## Novel Technology

### Dry chemical Etching at Atmospheric Pressure

Nines PV technology was developed in order to address the needs of the PV industry for high throughput, cost efficient, enabling etching solutions. The inline atmospheric nature of the process, combined with the high etch rate of the thermally activated gas etchant, lead to a high throughput solution that can be scaled accordingly. The chemical reactor is compact, and the process can be controlled accurately. The chemical etching zone is confined within a set of N2 gas curtains.



**NO VACUUM**



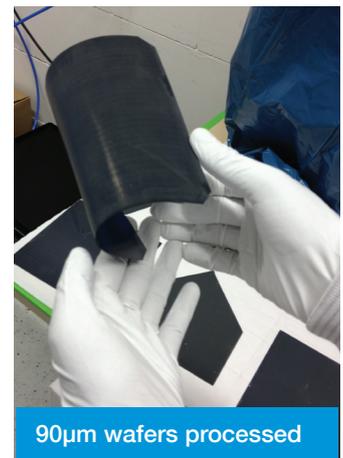
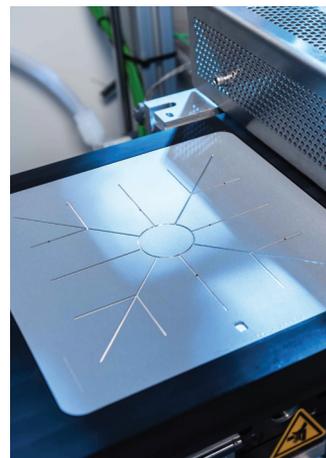
**NO PLASMA**

- Dry atmospheric etching process
- Single sided
- Compact footprint
- Zero GWP chemistry
- No water consumption

#### Applications:

- Mono,
- Quasi-mono
- Multi-c wafers
- Epitaxial layers

## Process development tool – single wafer/manually loaded



- Single lane
- Compact reactor
- Dynamic etching
- Up to 30% F2 concentration
- Multi-zone heating
- Integrated N2 dilution panel
- Total flow up to 35 slm

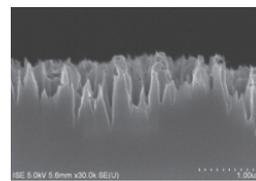
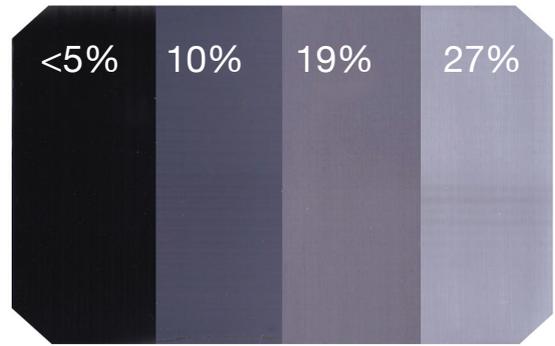
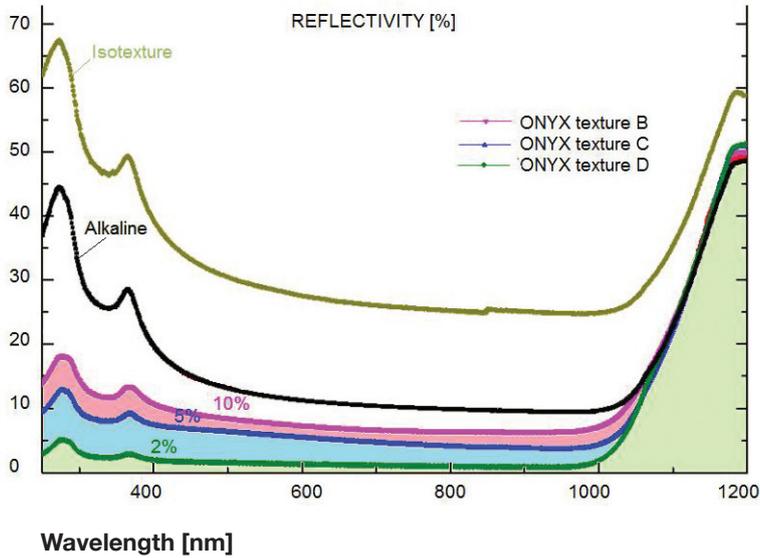
- Automated recipes
- Fast and simple to use
- Single sided process
- Wafer thickness <100 um

#### Note 1:

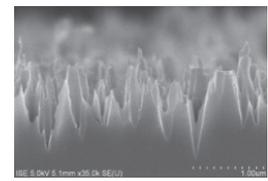
Upgradable to 200 Wfr/hr with automated load/unload available Q1 2014.

# PROCESS DEVELOPMENT

## Mono Si Wafer after 9s Dry Texture



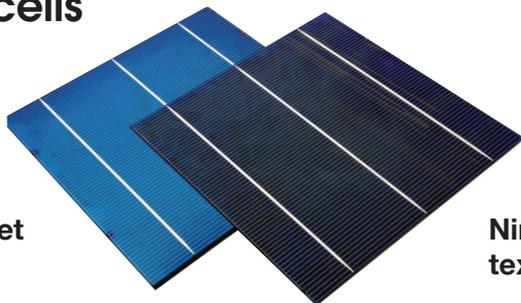
Process C



Process D

## Solar cells

Acidic wet texture

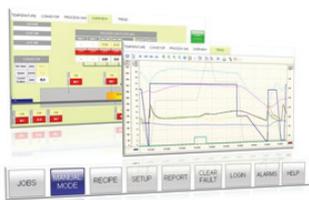


Nines texture

- Typical etching process time: <1min per 1um @ 10%, up to 3.4um/min
- Scalable platform; Reactor design and sized of 1000 w/h using 100% F2

Easy process transition to industrial (multi-lanes) version of the tool

## Software & control



- Integrated software for accurate process
- Full real time data logging
- User friendly touch screen interface
- Remote monitoring from Desktop

## R&D Set -up



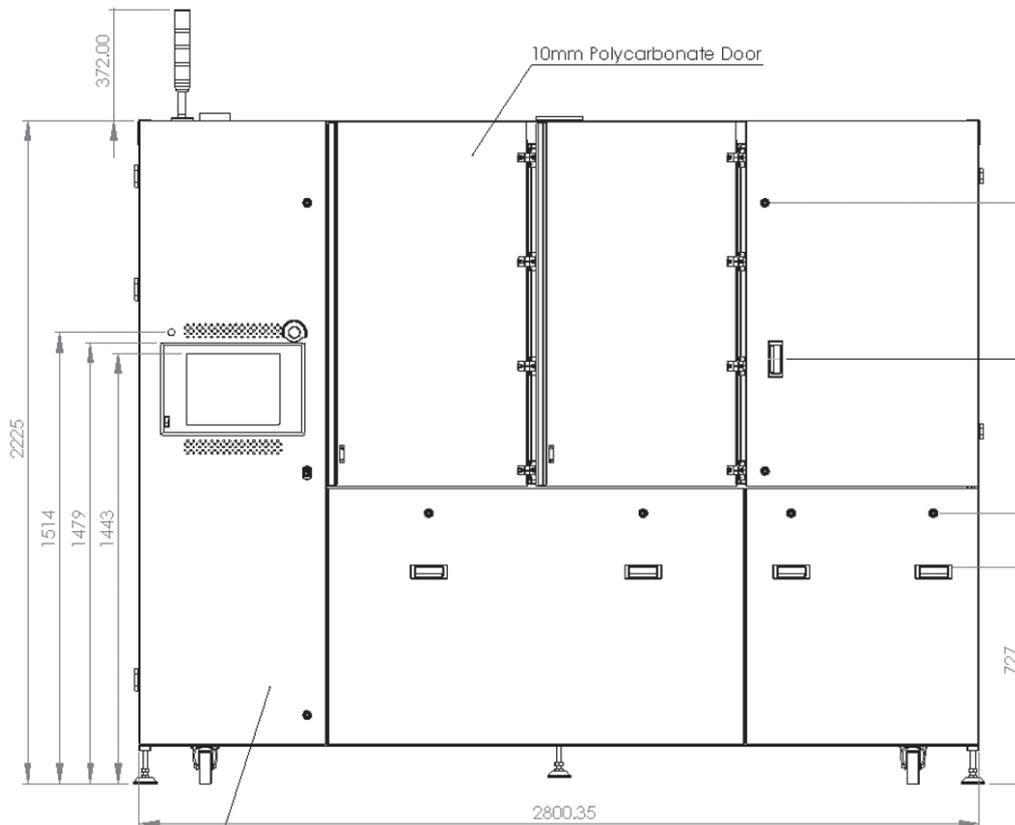
F2/N2 supplied from bottles



2.8 x1.3m Footprint



Compact Dry Scrubber



## 9sADE100

### Model

Etch rate	<1min per 1um @ 10%, up to 3.4um/min
Etch uniformity	Better than +/-5% across 156x156mm
Wafer size	Up to 156 mm x 156 mm
Wafer thickness	80 to 250 um - thicker wafers as option
Process type	single sided, <1mm wrap around from the edges
Wafer chuck	Aluminium, with vacuum holding ports
Temperature range	Max 350°C
Gases	Up to 30% F2
Purge gases	N2
Control system	Siemens S7 PLC
Foot Print	9 m <sup>2</sup> Including peripherals
OPTIONS	Automation with 100 wafer cassettes

## Process development tool

### Single wafer, manually loaded

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