



5-1-2015

# 1. Dry Etching of SiO<sub>2</sub>, SiN<sub>x</sub>, and Si using 80plus Reactive Ion Etcher

Prashanth Gopalan  
gpr@seas.upenn.edu

Follow this and additional works at: [http://repository.upenn.edu/scn\\_tooldata](http://repository.upenn.edu/scn_tooldata)

---

Gopalan, Prashanth, "1. Dry Etching of SiO<sub>2</sub>, SiN<sub>x</sub>, and Si using 80plus Reactive Ion Etcher", *Tool Data*. Paper 21.  
[http://repository.upenn.edu/scn\\_tooldata/21](http://repository.upenn.edu/scn_tooldata/21)

This paper is posted at ScholarlyCommons. [http://repository.upenn.edu/scn\\_tooldata/21](http://repository.upenn.edu/scn_tooldata/21)  
For more information, please contact [libraryrepository@pobox.upenn.edu](mailto:libraryrepository@pobox.upenn.edu).

---

# 1. Dry Etching of SiO<sub>2</sub>, SiN<sub>x</sub>, and Si using 80plus Reactive Ion Etcher

## **Keywords**

Etch rate, Dry Etching, SiO<sub>2</sub>, SiN<sub>x</sub>, Si, 80plus

## **Creative Commons License**



This work is licensed under a [Creative Commons Attribution-Share Alike 4.0 License](https://creativecommons.org/licenses/by-sa/4.0/).

# 1. Dry Etching of SiO<sub>2</sub>, SiN<sub>x</sub>, and Si using 80plus Reactive Ion Etcher (Graduate Student Fellow Program)

Prepare by Prashanth Gopalan (4/3/2014)

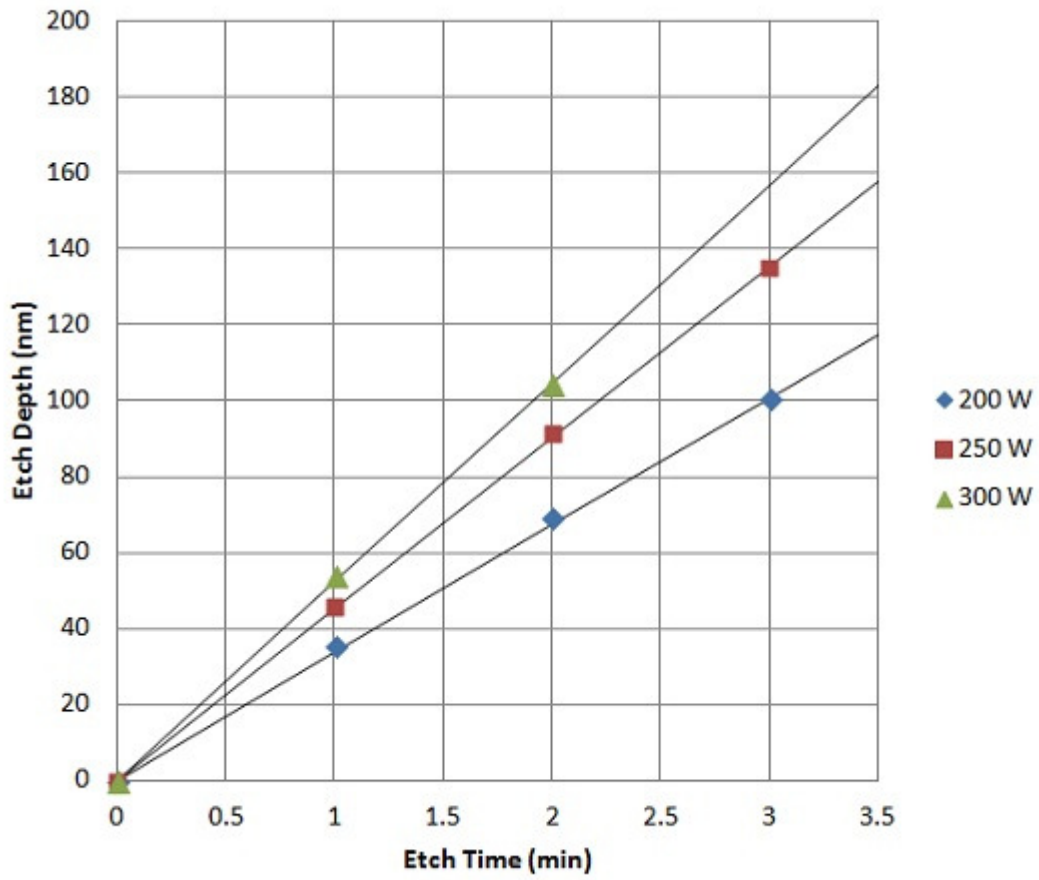
## **SiO<sub>2</sub> etch**

- Ar = 38 sccm
- CHF<sub>3</sub> = 12 sccm
- Pressure = 30 mTorr
- Power = 200 W
- T = 17.5 °C
- Etching rate: 33 nm/min

**Note:** Etch rate also depends on the sample size and percentage of the open area, which is not covered by resist film.

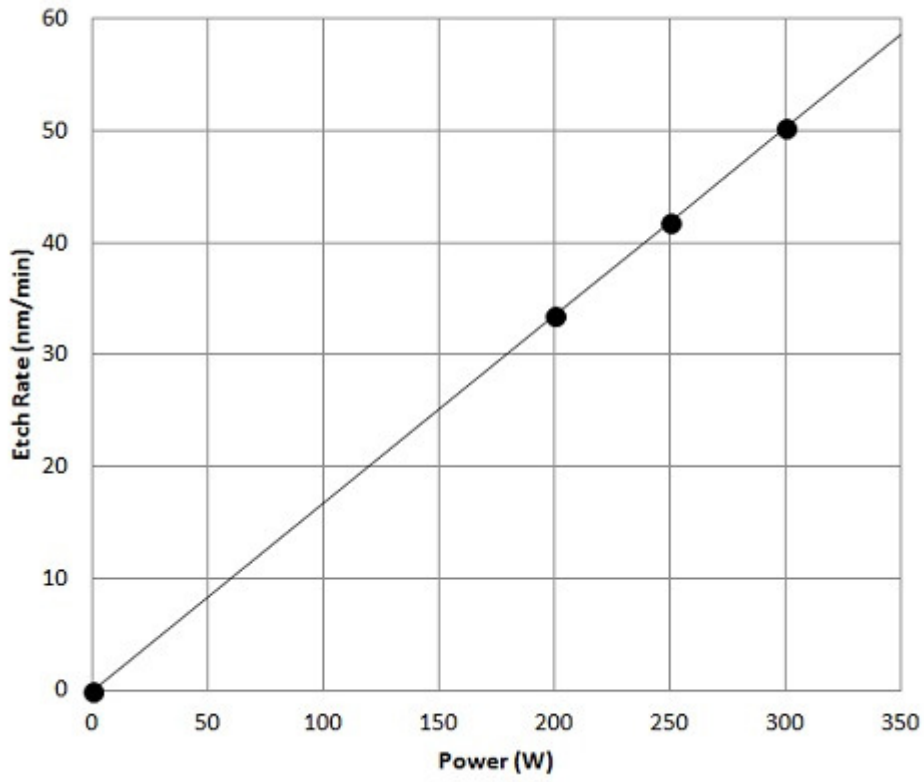
**Time and power dependence of etch depth** (12/6/2013)

**Time and power dependence of Etch depth**



**Power dependence of etch rate (1/9/2014)**

Power dependence of etch rate

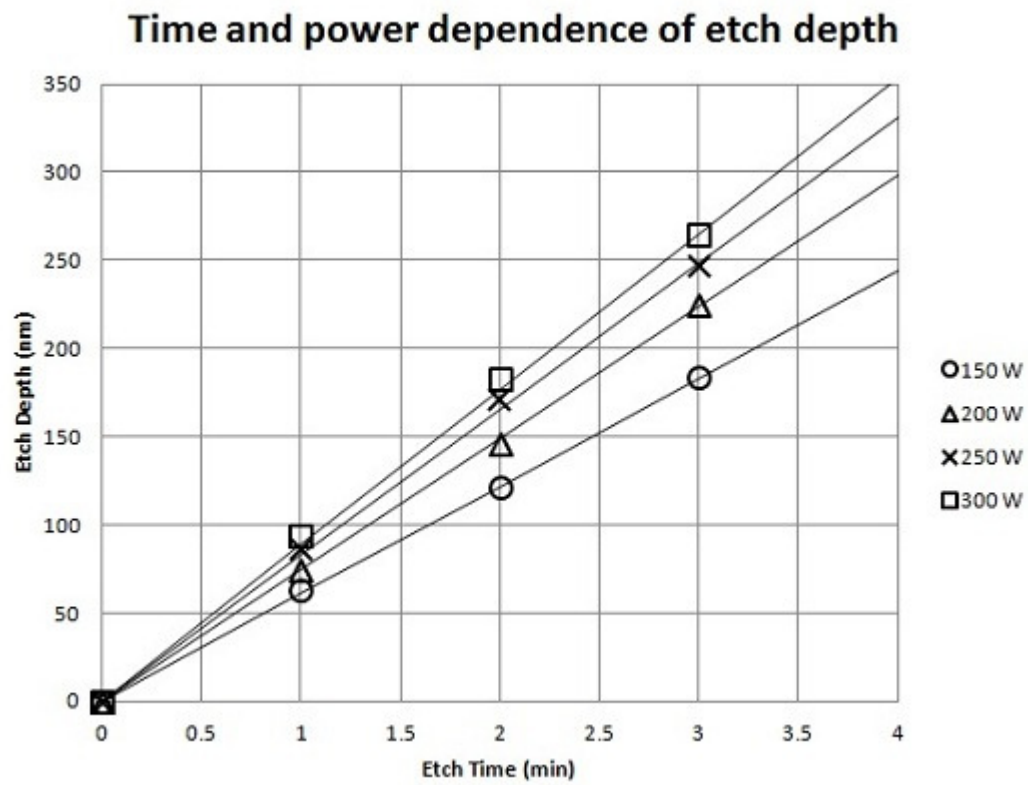


## SiN<sub>x</sub> etch

- O<sub>2</sub> = 5 sccm
- CHF<sub>3</sub> = 50 sccm
- Pressure = 20 mTorr
- Power = 150 W
- T = 17.5 °C
- Etching rate: 61 nm/min

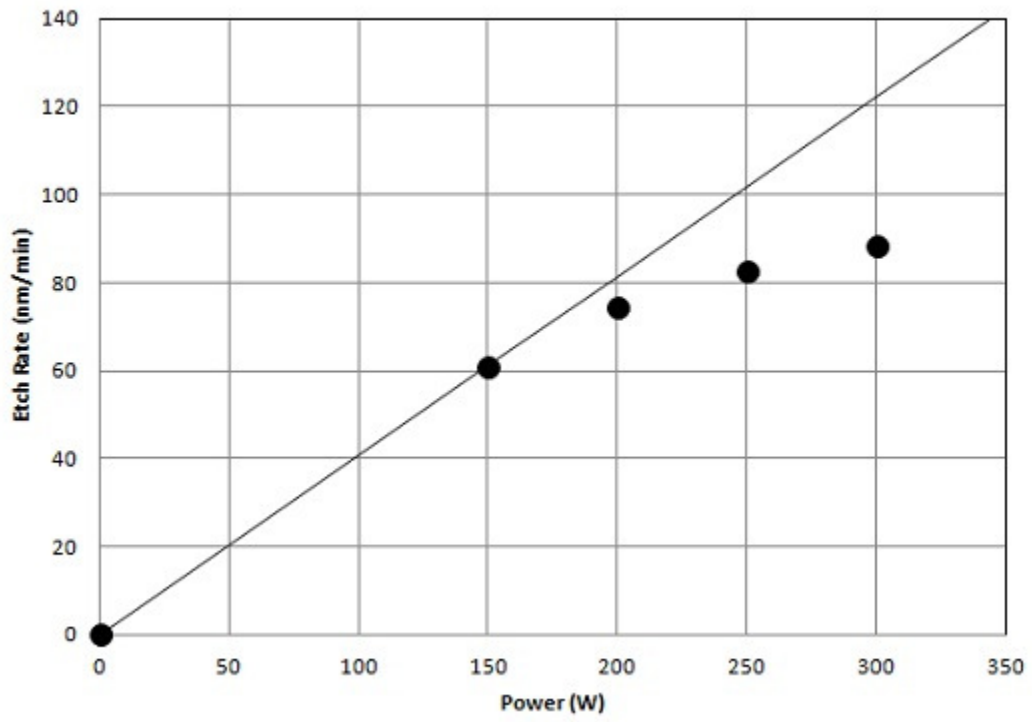
**Note:** Etch rate also depends on the sample size and percentage of the open area, which is not covered by resist film.

### Time and power dependence of etch depth (1/9/2014)



Power dependence of etch rate (1/9/2014)

Power dependence of etch rate

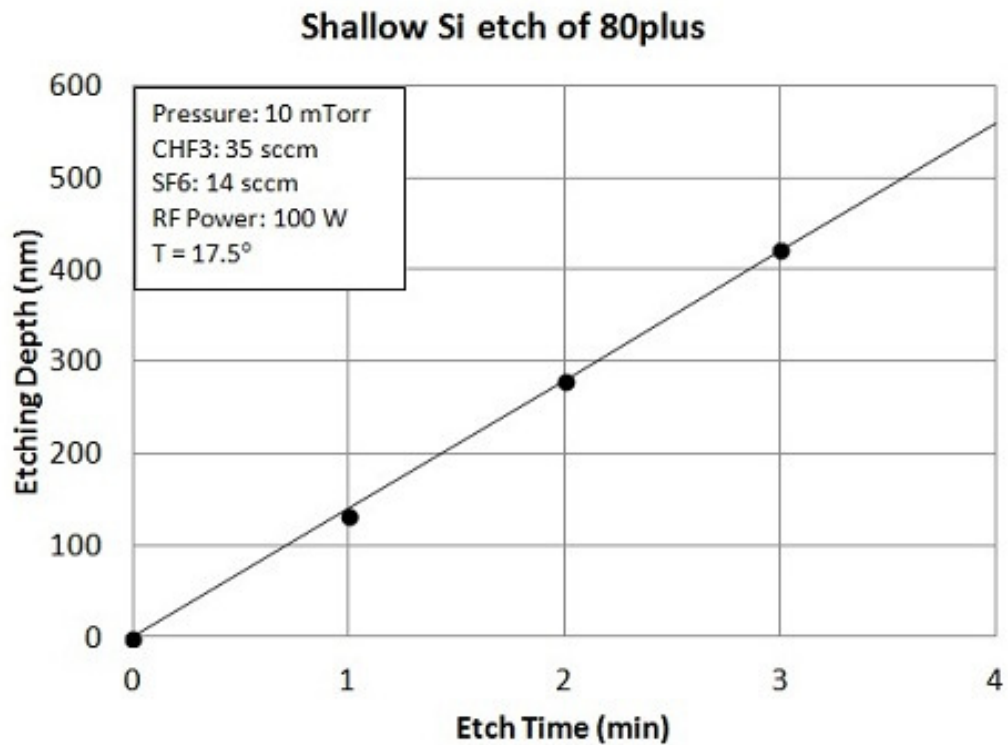


## Shallow Si etch

- Pressure: 10 mTorr
- CHF3: 35 sccm
- SF6: 14 sccm
- RF power: 100 W
- T = 17.5 °C.
- Default etching rate: 35 nm/min

**Note:** Etch rate also depends on the sample size and percentage of the open area, which is not covered by resist film.

- 4/3/2014
- The sample size: ~10 x 10 mm<sup>2</sup>
- Percentage of the open area: ~80%
- Etch rate: 140 nm/min



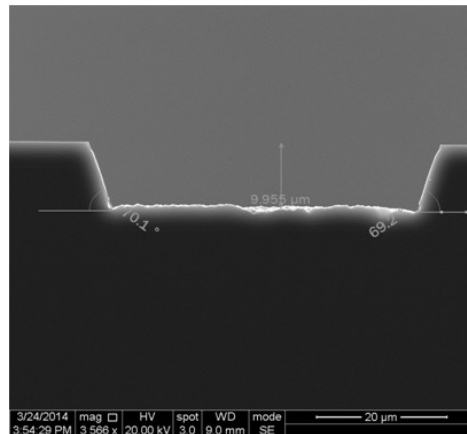


## Deep Si etch

- SF6 = 50 sccm
- O2 = 10 sccm
- Pressure = 150 mTorr
- RF power = 100 W
- T = 20 °C
- Etch rate 500-700 nm/min (in the brochure)
- Selectivity to SiO2 mask: >50:1

**Note:** Etch rate also depends on the sample size and percentage of the open area, which is not covered by resist film.

- 3/24/2014:
- 440 nm thick SiO2 mask
- 20 min etch, etch rate =  $482 \pm 14$  nm/min
  - **Note:** The verticality will be investigated.



- 30 min etch, etch rate =  $528 \pm 14$  nm/min
  - **Note:** The verticality will be investigated.

