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Reactive Ion Etch (RIE) of Silicon Dioxide (SiO₂) with Tetrafluoromethane (CF₄)

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Summary/Description

This report discusses the CF₄ etch process of SiO₂ using the Oxford 80 Plus RIE.

Disciplines

Nanoscience and Nanotechnology

	Reactive Ion Etch (RIE)	Document No:
	Silicon Dioxide (SiO ₂) with CF ₄	Revision:
	Oxford 80 Plus	Author: Meredith Metzler

1. Introduction

The purpose of this document is to examine the etch properties of the Oxford 80 Plus RIE system.

2. Baseline Recipe

Units:

Gas flow rate: standard cubic centimeters per minute (sccm)

Pressure: millitorr (mT)

Temperature: degrees Celsius (C)

High frequency (RF) power: Watts (W)

Step 1: Pump to 5e-04 Torr, "Pump to Pressure" checked

Step 2: Etch Step

Tetrafluoromethane (CF₄) flow rate: 20 sccm

Pressure: 65 mT

RF Power: 150 W

Capacitor starting points: Capacitor #1: 80 %, Capacitor #2: 60 %

Time set point is hh:mm:ss (hours:minutes:seconds)*

Temperature: 15 C

Step 3: Pump to 5e-04 Torr, "Pump to Pressure" checked

*notes for Step 2: The time set point for the etch step should be kept below 10 minutes due to thermal issues and to avoid resist burning. If a longer time is needed for a thicker film then the system should be vented prior to running the process again.

3. Etch Characteristics

Film thickness is measured using a Filmetrics F50 optical interferometer which is equipped with a motorized stage allowing for the collection of full wafer maps. See the following link for more information about this instrument:

<http://www.filmetrics.com/thicknessmeasurement/f50>

The film being etched is PECVD SiO₂ deposited on 100 mm, <100> orientation, wafers that are 525 ± 25 micron thick.

Figure 1 below shows a screen capture image of a “Difference Map” from the Filmetrics software with 115 data points and a 5 mm edge exclusion. The standard SiO₂ material file supplied in the software is used for these measurements. This is data from a 3 minute etch shown as a “Difference Map” in the software that is already averaged and is displaying the etch rate in nm/min.

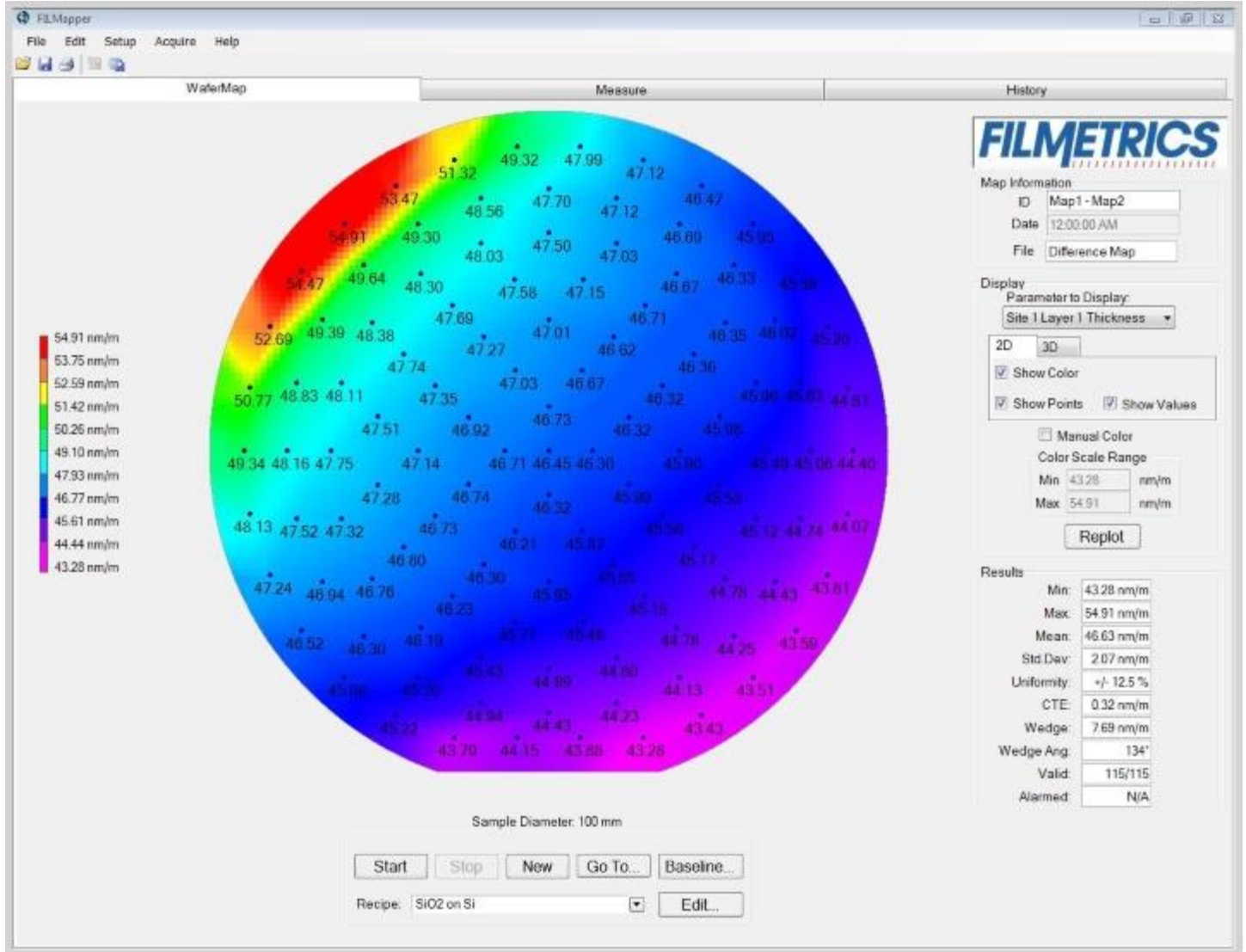


Figure 1. Wafer map showing the results for a 3 minute SiO₂ etch using CF₄ showing 47 nm/min etch rate with a standard deviation of 2.07 nm and a uniformity across the wafer of ± 12.5%. Note that this wafer slid from the center of the electrode to the edge prior to being etched.