ibss Group, Inc. GV10x

Nano Technology Systems Division

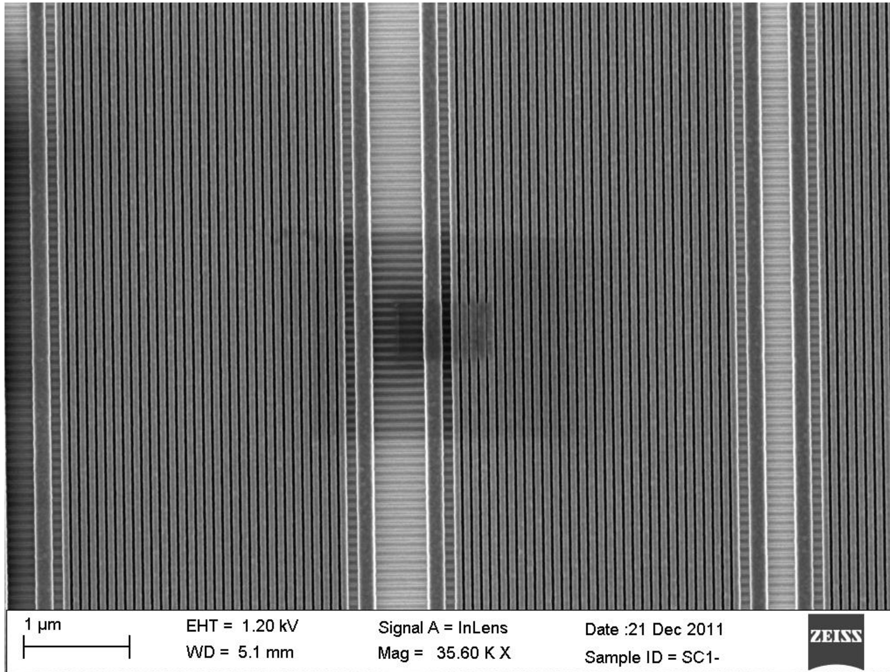
Downstream Asher for In-situ Specimen and Specimen Chamber Cleaning

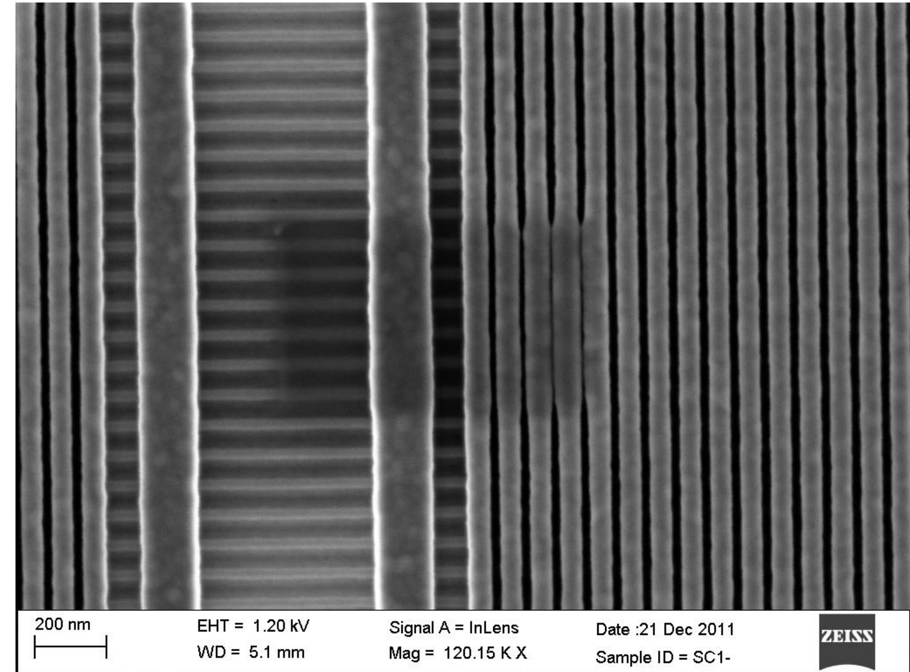
Test Procedure

- One wafer sample was mounted to a pin type stub using carbon graphite conductive paint
- The sample was imaged in the Carl Zeiss Merlin FESEM as received and without cleaning or sputter coating
- To produce a contamination rectangle, the wafer sample was imaged for 10 minutes at 1.2kV, 144pA beam current, and at 120kX magnification in reduced area scan mode
- The sample was tilted to 40° and lowered to a working distance of 20mm to improve the line of site to the **GV10x** cleaner
- The EHT was turned off and column valve manually closed
- The **GV10x** cleaner was run at 45 watts, 7.53-10^{-}4Torr and clean time of 3 minutes - the contamination rectangle was still visible on the wafer surface
- The wafer was imaged in an adjacent area for 10 minutes at 1.2kV, 144pA beam current, and at 120kX magnification and only produced a slight contamination rectangle
- The wafer was again cleaned for two additional times of 5 minute each using the same cleaning conditions
- A slight amount of contamination was present after a total clean time of 13 minutes,
- Another adjacent area was also imaged (after a clean time of 13 minutes) and did not produce a contamination rectangle

Before Cleaning

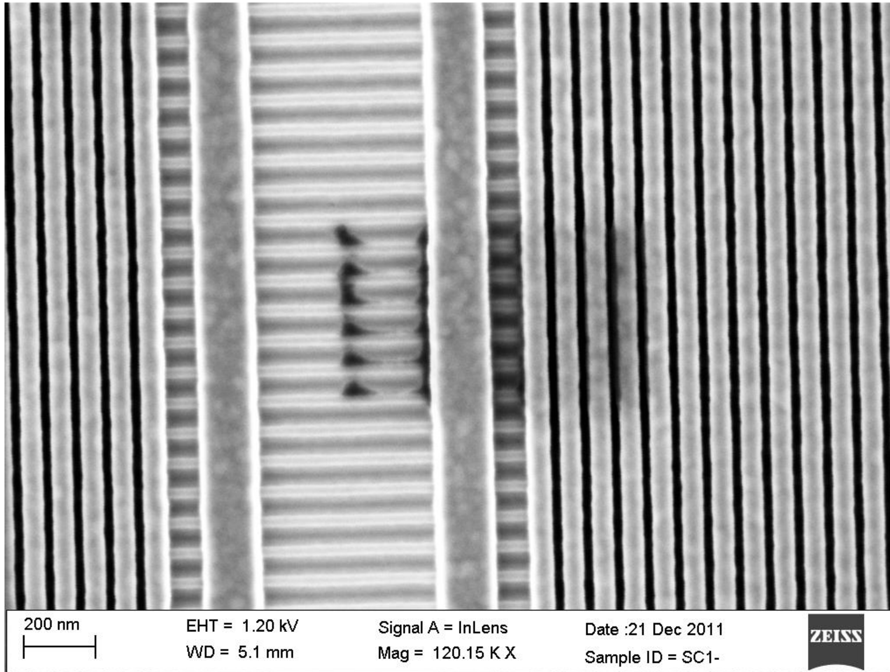
CARL ZEISS SMT



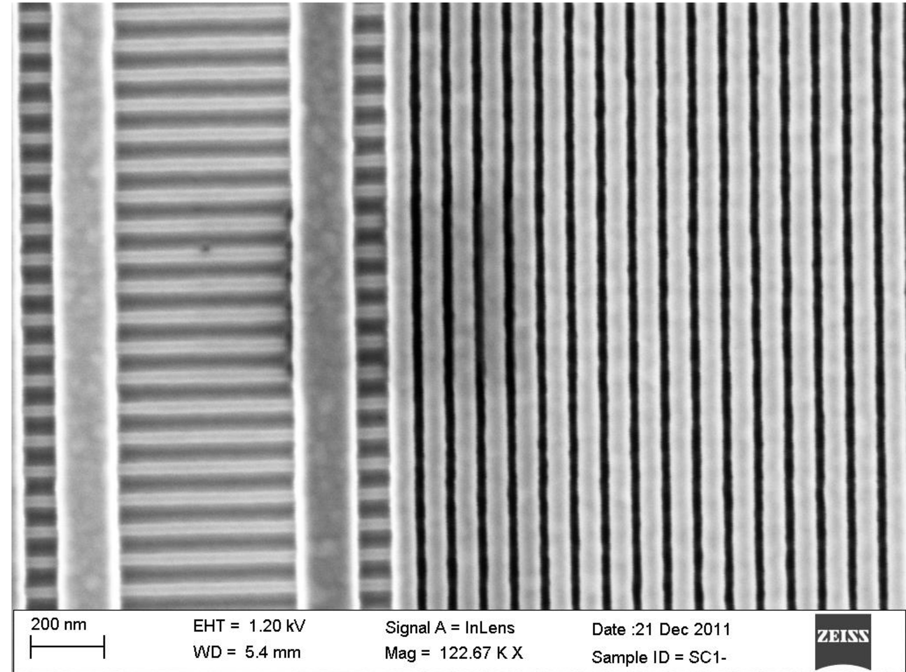


Imaging Conditions: 1.2kV Accelerating Voltage
144pA beam current
10minutes scan time
6.08-10^{-}6 Torr chamber pressure

After Cleaning

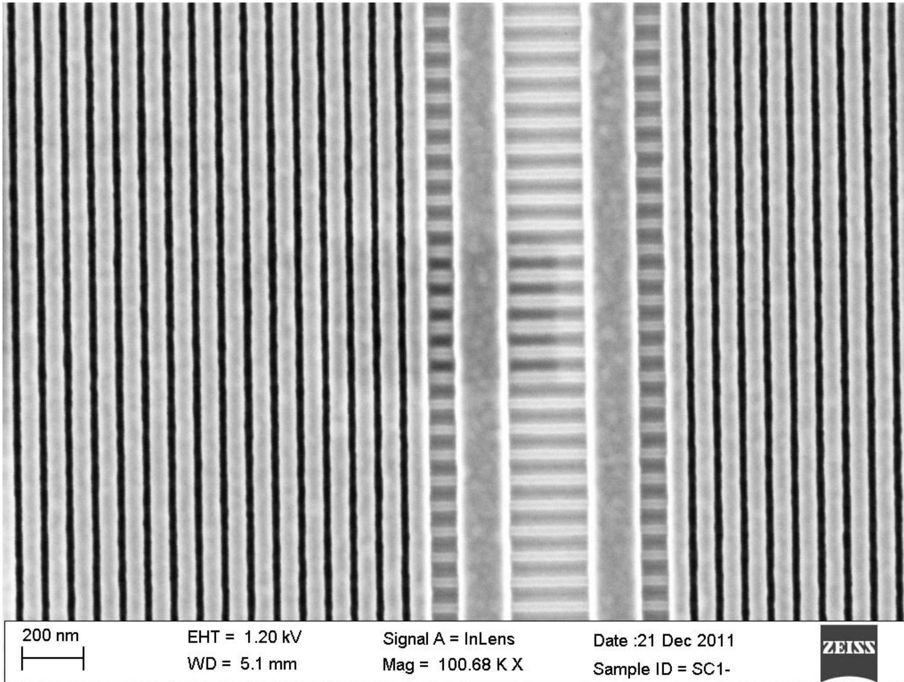


Imaging Conditions: 1.2kV Accelerating Voltage
144pA beam current
6.08-10^{-6} Torr chamber pressure
Cleaning Conditions: 45 Watts
8 minutes (3mins plus 5mins)
7.53-10^{-4} Torr chamber pressure



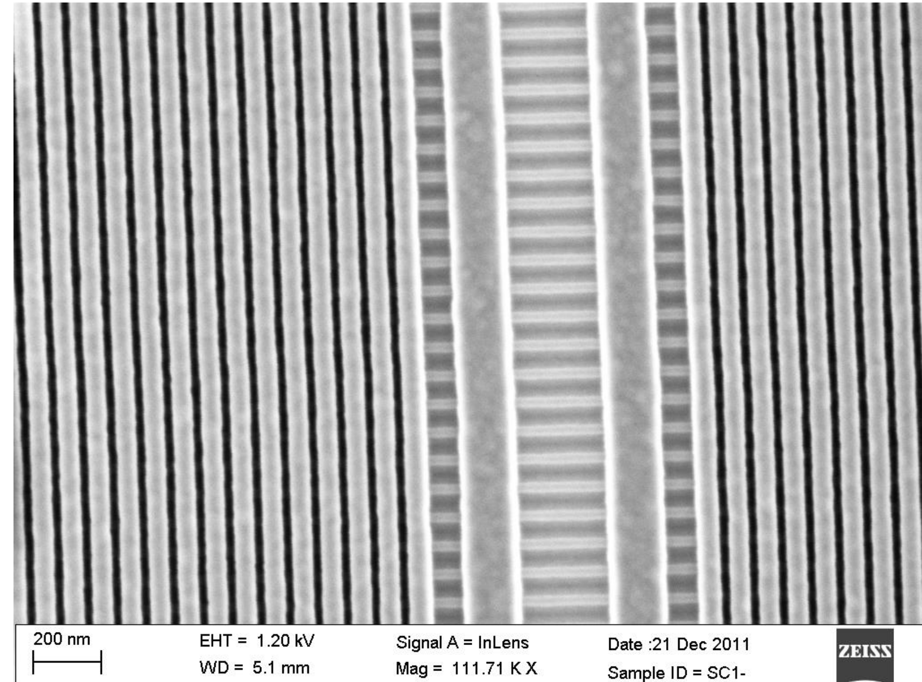
Imaging Conditions: 1.2kV Accelerating Voltage
144pA beam current
6.08-10^{-6} Torr chamber pressure
Cleaning Conditions: 50 Watts
13 minutes (total clean time)
7.32-10^{-4} Torr chamber pressure

Adjacent Area Scans



Imaging Conditions: 1.2kV Accelerating Voltage
144pA beam current

Note: After an initial clean time of 3 minutes, only a slight contamination rectangle was visible after scanning for 10 minutes



Imaging Conditions: 1.2kV Accelerating Voltage
144pA beam current

Note: After a total clean time of 13 minutes, no contamination was visible after scanning for 10 minutes

Summary

- The ibss **GV10x** cleaner was able to remove nearly all contamination build-up from the wafer surface after a total clean time of 13 minutes.
- Further cleaning may have completely removed the contamination rectangle
- It was noted that the line-widths before cleaning were significantly larger from the contamination build-up, but reduced back to the original line width after cleaning
- The ibss **GV10x** cleaner cleaned the surface of the wafer (prior to imaging) and did not show signs of contamination build-up
- The ibss **GV10x** cleaner was fast, simple to use and did not require any modifications to the vacuum system
- Further testing should be done to better understand the rate of contamination removal and the affects of time, wattage and chamber vacuum conditions on various types of samples and applications