Knowledge Article

Examination of Effectiveness of Henniker Plasma Cleaner using a Holey Carbon Film by TEM

Our low cost plasma cleaners/plasma ashers for TEM sample holders are designed specifically for fast and efficient cleaning. They are fully automated and supplied with standard adapters which are suitable for the sample holders supplied with all the major microscope manufacturers.

The plasma output power is fully variable over the range 0-100W, resulting in a very controllable & gentle cleaning process.

Common sources of error inside the TEM are clearly reduced with plasma cleaning and the dwell time during the measurement is significantly increased.

HPT-100 TEM Features

- Low power operation
- Front feed of TEM sample holder
- Multiple TEM grids and SEM stub cleaning
- Re-entrant style sample holder introduction
- Dual gas inlets for O2/Ar and other gases

This work within this knowledge article shows the effectiveness of the plasma treatment capability of the Henniker Plasma cleaner at different times and power levels.

"The Henniker HPT plasma cleaner was observed to be suitable for TEM preparation purposes because it offers amazing control over how much carbon is removed from samples. "

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Plasma Cleaning Method

Henniker HPT-100 Plasma Cleaner with Jeol TEM sample holder adapter.Continuously variable power output from 0-100W and dual digital MFC gas mixing.

Samples were introduced via the front feedthrough adapter and cleaned with Ar:O2 95:5 mixture at low power (20W and 50W) in 30sec time steps. Results for accumulated treatment time are presented.

Fig 1. Henniker Plasma with TEM Adapter.

Preparation and Examination Methods

- A holey carbon-coated Cu TEM grid.
- The samples were examined in the JEM 2800 (Scanning) Transmission Electron Microscope using the following instrumental conditions: Voltage (kV) 200; C2 aperture (um) 70 and 40;
- Bright-field imaging mode using CCD High magnification lattice resolution imaging mode using CCD

Analysis Region

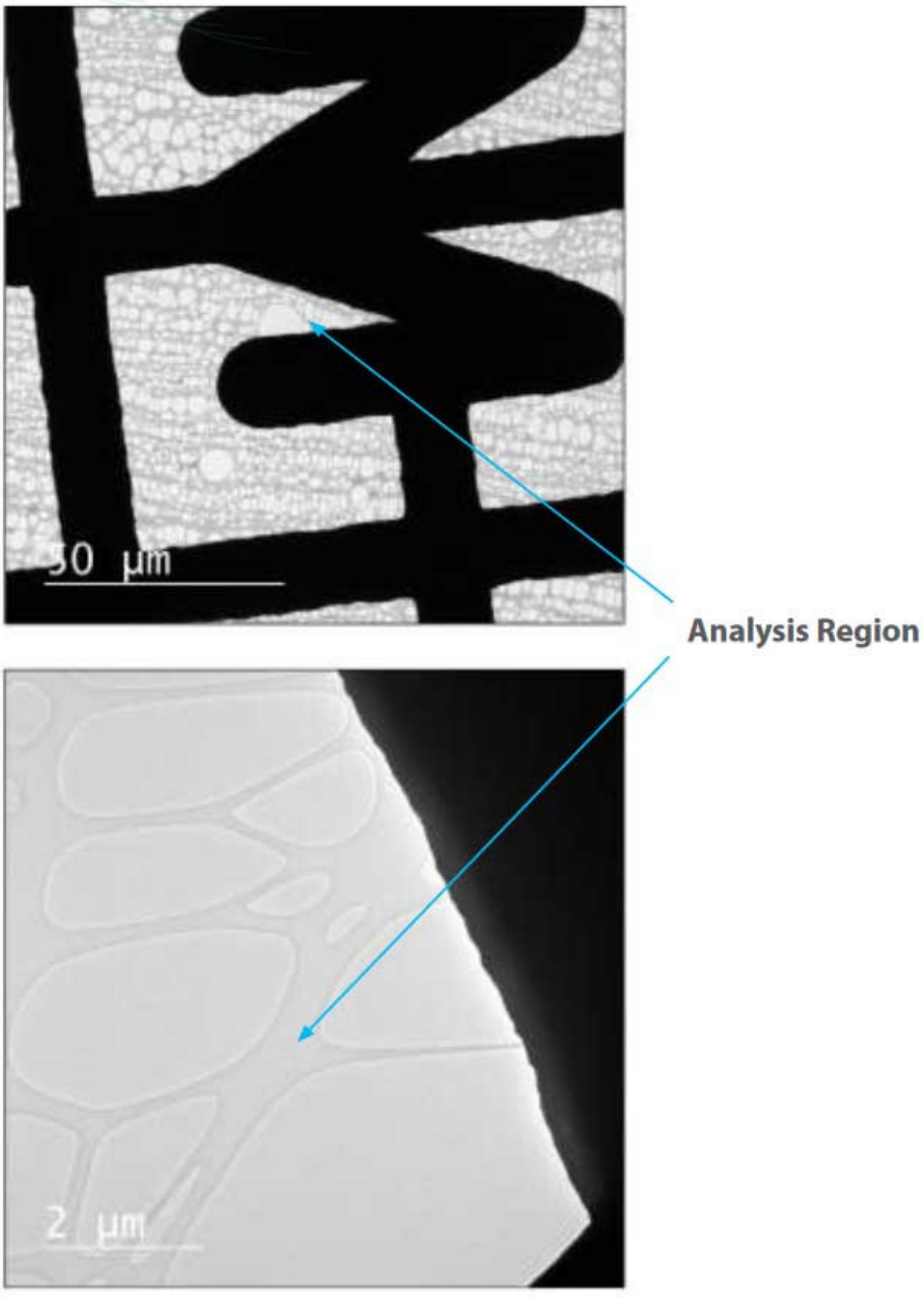

Fig 2&3. Analysis Region 50µm & 2µm

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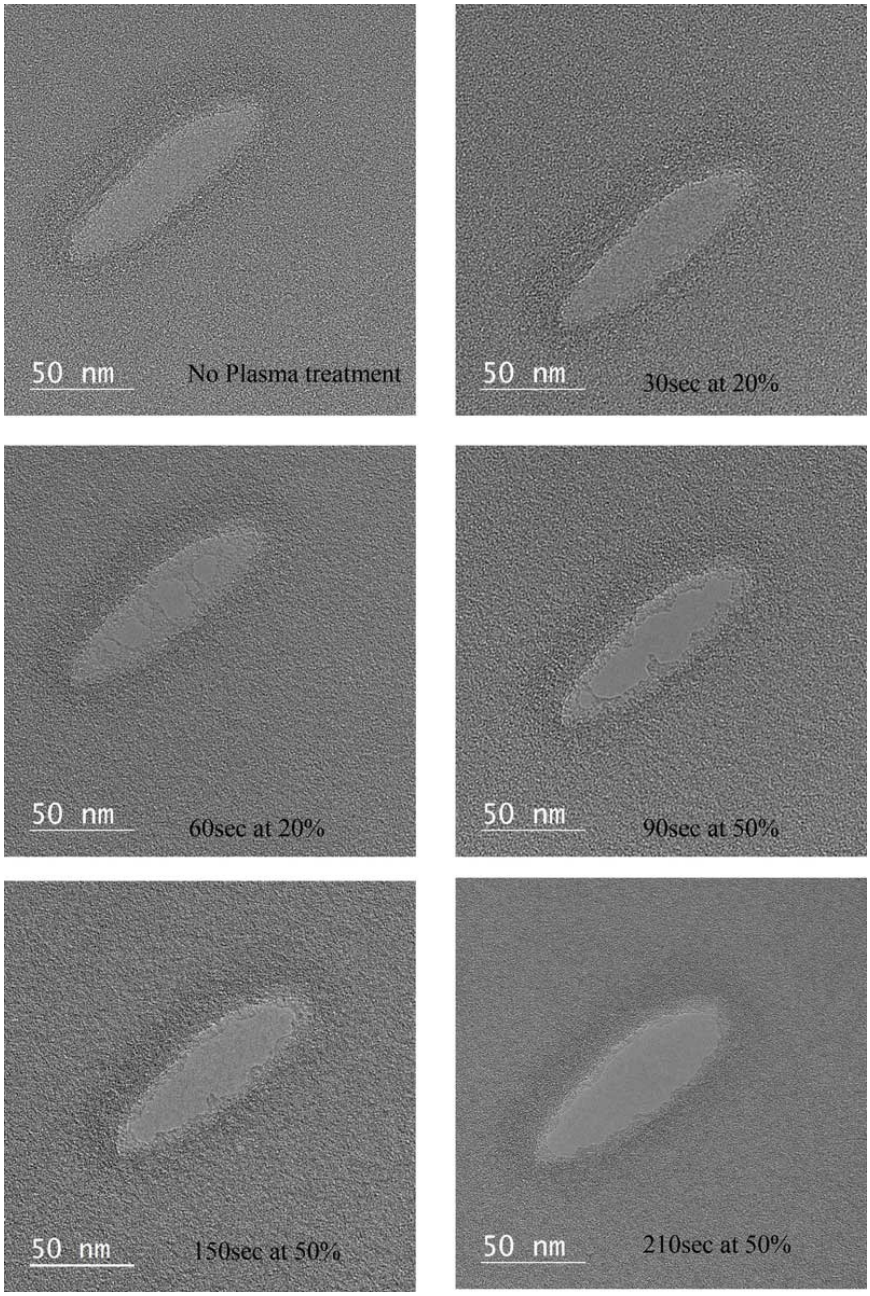
Preparation and Examination Methods

Cleaning progression for selected thinned analysis region showing gradual loss of carbon from the region followed by gradual loss from thicker wall regions.



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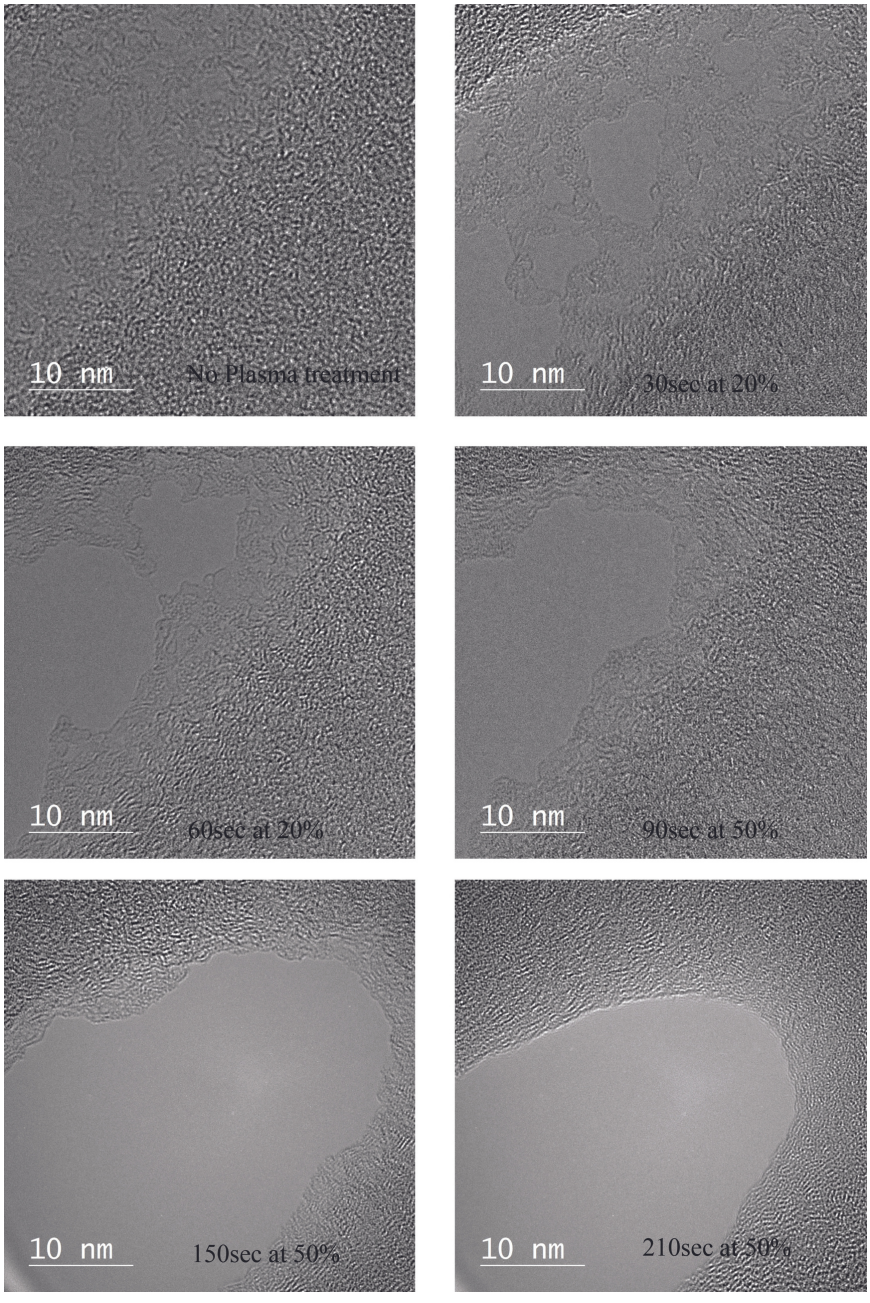

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Conclusion

This work shows the effectiveness of the plasma treatment capability of the Henniker Plasma cleaner at different times and power levels.

The images taken from an identical location using a finder holey carbon grid showed a gradual loss of carbon from a small thinned area of carbon. First, the thinned carbon was removed (or eaten away). Then the thick walls were observed to lose carbon from the edges.

Dr Dogan Ozkaya (Johnson Matthey Technology Centre);

"In conclusion, the Henniker HPT plasma cleaner was observed to be suitable for TEM preparation purposes because it offers amazing control over how much carbon is removed from samples. It is suitable for catalyst samples on carbon for hydrocarbon contamination cleaning in the TEM."

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