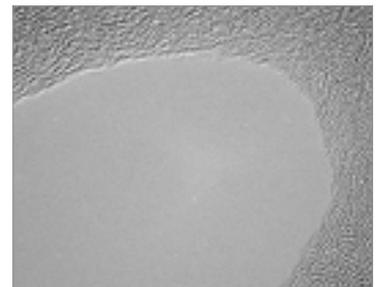


passionate about plasma

Activation | Cleaning | Coating | Etching

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

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



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

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

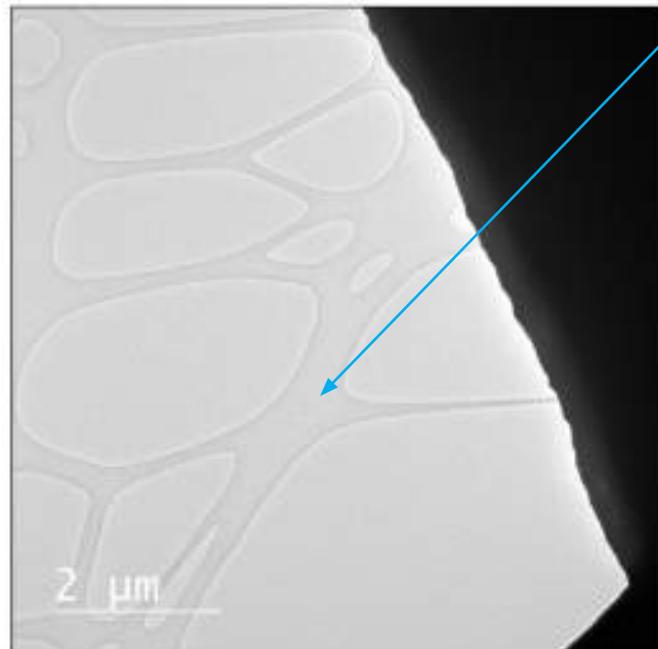
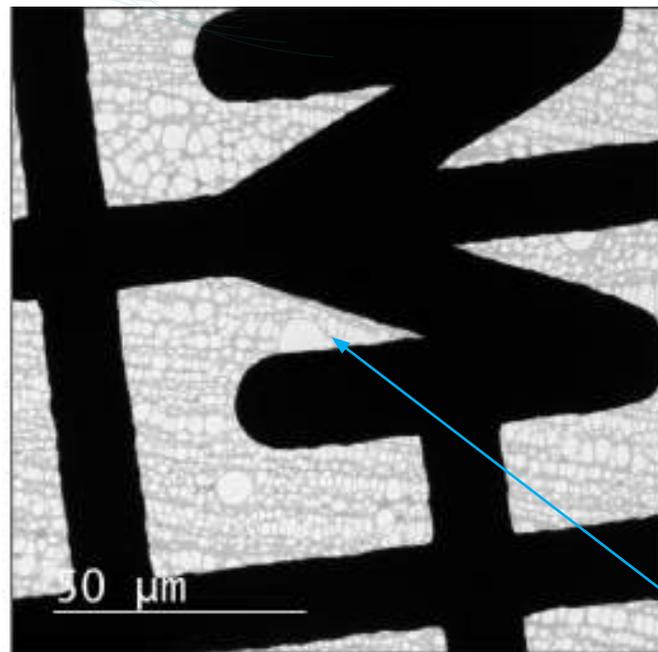
Preparation and Examination Methods

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

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

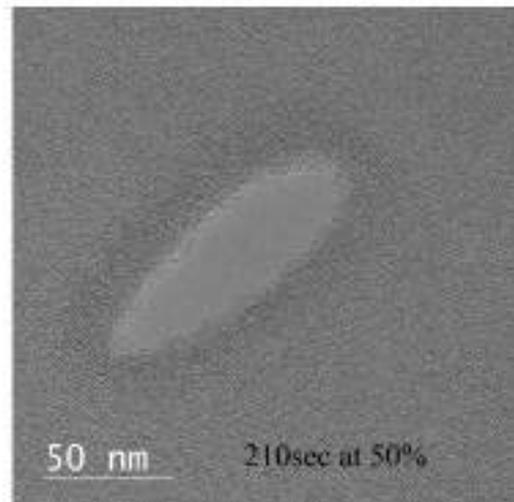
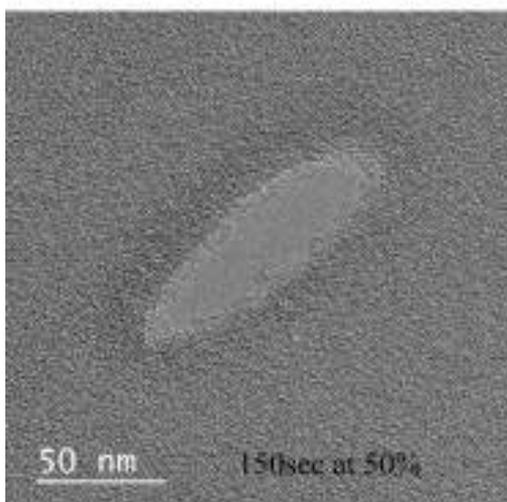
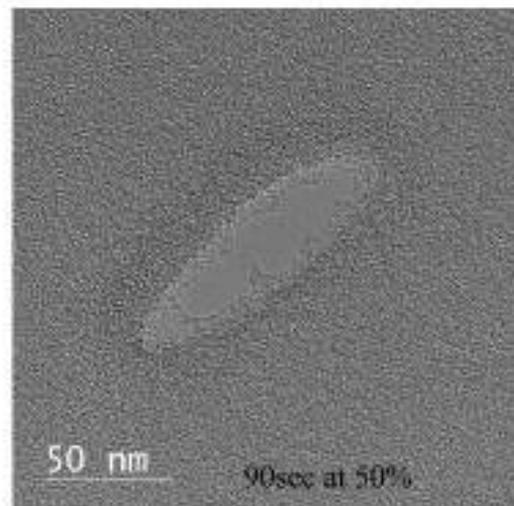
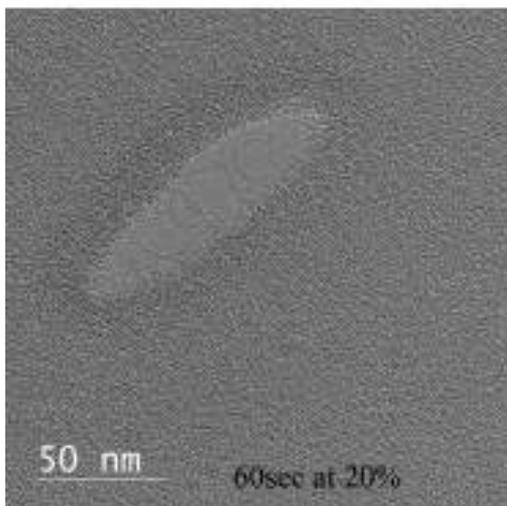
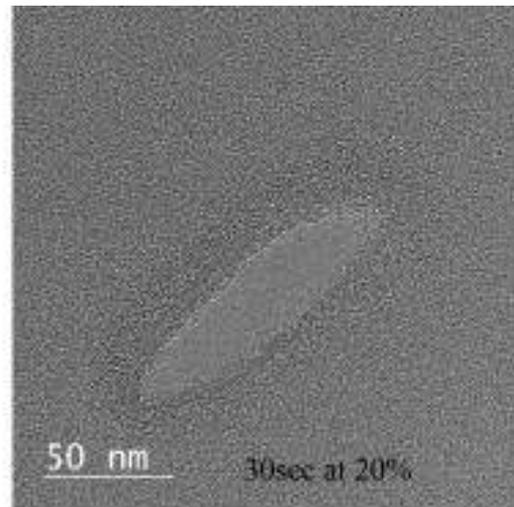
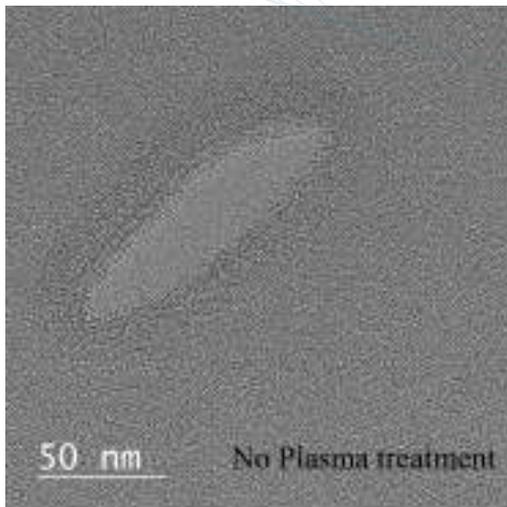


Analysis Region

Fig 2&3. Analysis Region 50μm & 2μm

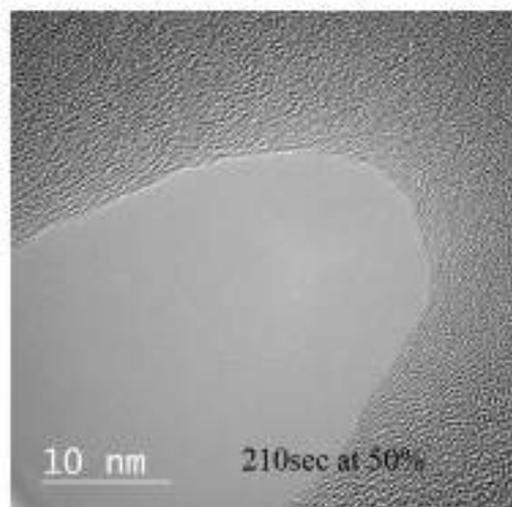
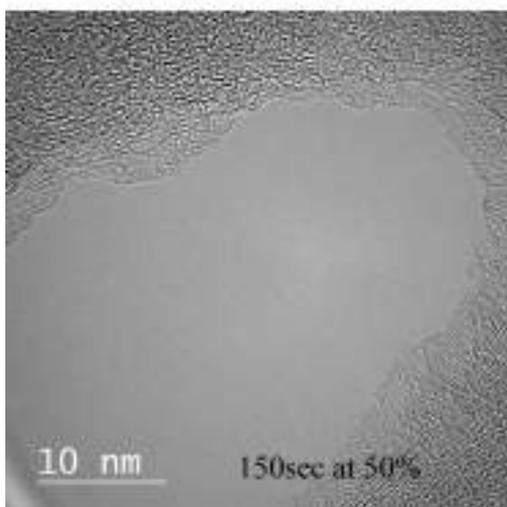
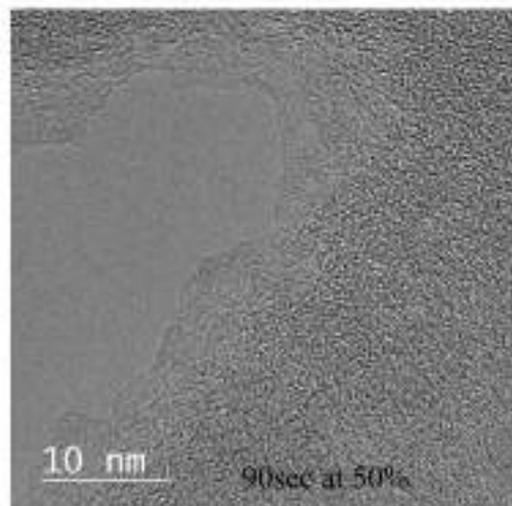
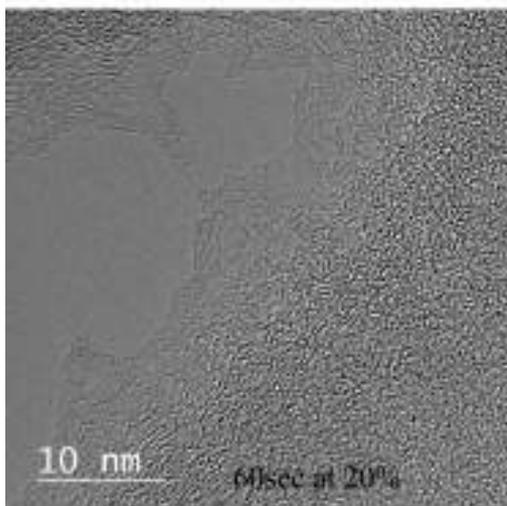
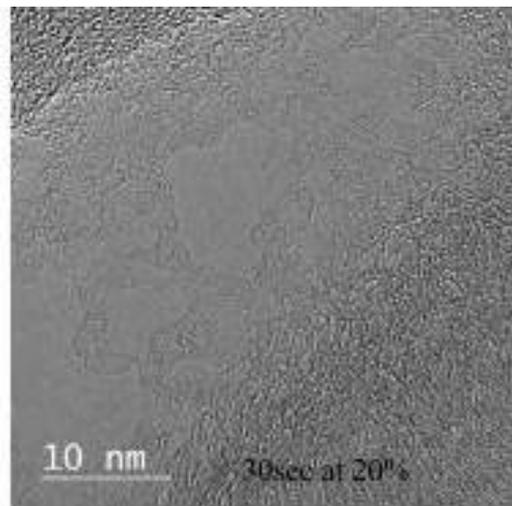
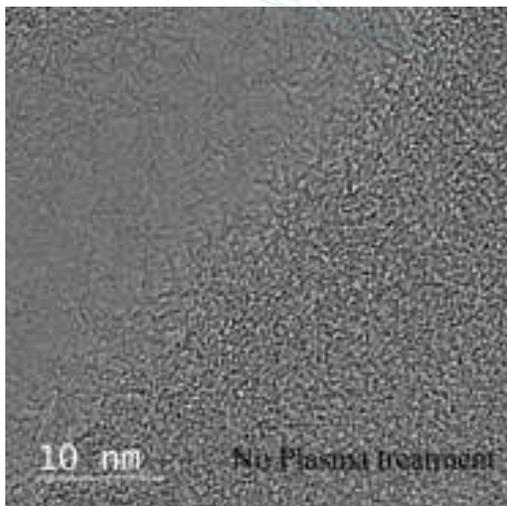
Examination of Effectiveness of Henniker Plasma Cleaner using a Holey Carbon Film by TEM

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



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

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



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

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 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."

Acknowledgements

We gratefully acknowledge the work of Dr. Dogan Ozkaya and the talented Microscopy group members of **Johnson Matthey Technology Centre** who provided the detailed analyses presented in this note.

Henniker Plasma | **Address:** 3 Berkeley Court, Manor Park, Runcorn, WA7 1TQ, UK

Tel: +44 (0) 1925 830 771 **Fax:** +44 (0) 1925 800 035

Email: info@plasmatreatment.co.uk **Web:** www.plasmatreatment.co.uk



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