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.
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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:O$_2$ 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
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Fig 2&3. Analysis Region 50µm & 2µm
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Cleaning progression for selected thinned analysis region showing gradual loss of carbon from the region followed by gradual loss from thicker wall regions.

- No Plasma treatment
- 30sec at 20%
- 60sec at 20%
- 90sec at 50%
- 150sec at 50%
- 210sec at 50%
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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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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.

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“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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