



Decomposition of halogenated molecules in a microstructured electrode sustained glow discharge at atmospheric pressure

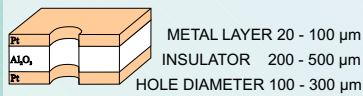


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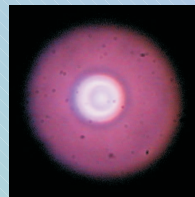
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MICROSTRUCTURED ELECTRODE (MSE) SUSTAINED DISCHARGE

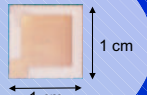
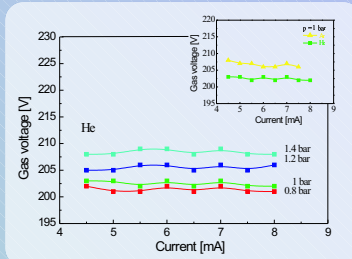


Plasma parameters at atmospheric pressure

	gas temperature	electron density
Argon	2200 K	$5 \times 10^{15} / \text{cm}^3$
Helium	1100 K	$5 \times 10^{14} / \text{cm}^3$



MICRODISCHARGE



ATMOSPHERIC PRESSURE GLOW DISCHARGE

Introduction

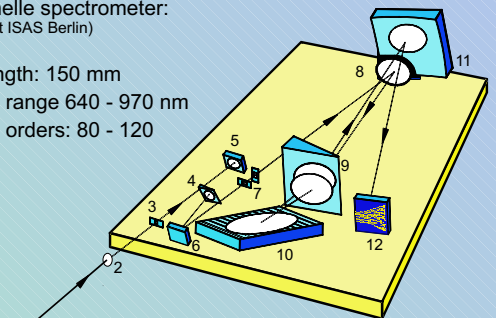
- the use of a microdischarge operated at atmospheric pressure for the decomposition of halogenated hydrocarbons
- detection of halogens excited in the MSE sustained plasma by emission spectroscopy
- other applications of MSE



Experimental setup

Small Echelle spectrometer: (developed at ISAS Berlin)

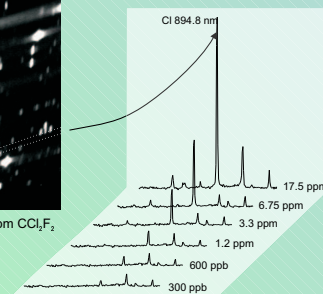
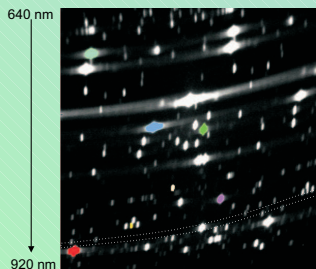
- focal length: 150 mm
- spectral range 640 - 970 nm
- spectral orders: 80 - 120



- 1: MSE discharge
- 2: lens, plasma imaged
- 3 to 6: predispersing illumination optics
- 7 to 11: Echelle spectrometer
- 8, 11: spherical mirrors
- 9: cross-dispersing prism
- 10: echelle grating
- 12: CCD: matrix detector (1024x1024 pixel)

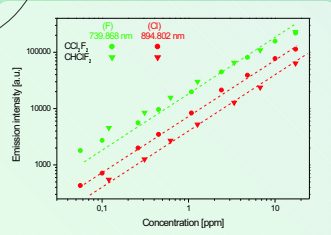
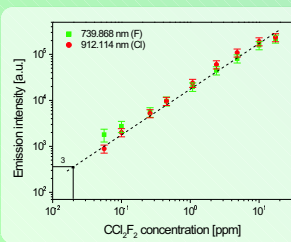
Results / Discussion

Element	[nm]
Cl	912.114
Cl	894.802
F	739.868
F	733.195
He	728.134
He	667.815
H	656.358
N	868.028
O	844.675
Ar	777.194
Ar	811.531
Ar	750.386



Calibration curve of CCl2F2 in Helium

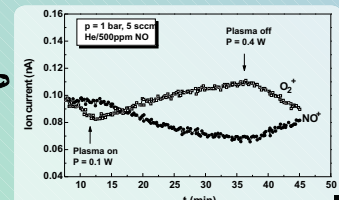
- linearity indicates robustness of the plasma
- 3 detection limit of 20 ppb Cl or F



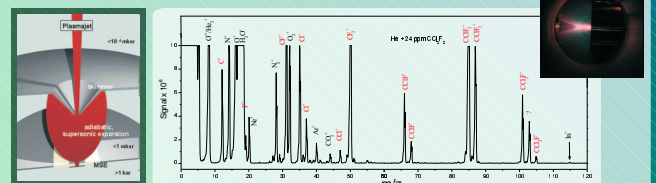
Different molecules: complete dissociation

Other applications

Waste gas treatment



MSE as ion source



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