Carter Thesis Update

Davin Carter

OKANAGAN
ORCAC
Jan. 11, 2010

Carter Thesis Committee

Dr. Rob O'Brien

Dr. Al Vaisius

Dr. Paul Shipley

THE UNIVERSITY OF BRITISH COLUMBIA

UBC OKANAGAN

I agree to serve on the Advisory Committee for

Davin Carter (M.Sc.)

Supervisor		
Rob O'Brien		July 12, 2007
Print Name	Signature	Date
Al Vaisius		2.VIII.07
Print Name	Signature	Date
PAUL SHIPLEY		Aug 9, 2007
Print Name	Signature	Date

The role of the student advisory committee is defined in the Chemistry Graduate Program, as reproduced below.

STUDENT ADVISORY COMMITTEES

A student's advisory committee consists of three members of the graduate program committee, one of whom is the student's thesis supervisor. The composition of a committee is determined by the Graduate Program Coordinator (GPC) in consultation with the student's thesis supervisor. The GPC will endeavour to ensure that at least one of the members of each M.Sc. advisory committee has successfully supervised a student through the completion of a M.Sc. or Ph.D. degree. Similarly, the GPC will arrange, when possible, that at least one of the members of each Ph.D. advisory committee has successfully supervised a student through the completion of a Ph.D. degree. Although, primary supervision of a student rests with the student's thesis supervisor, the advisory committee must conduct an annual review of the student's progress and file a report with the GPC. The report may include recommendations such as, transfer of the student to the Ph.D. program, or require the student take additional courses or seminars above and beyond the program requirements, or request the withdraw of a student from the program in the case of unsatisfactory progress. The advisory committee will also form the core of a student's Comprehensive Examination Committee and Oral Examination Committee in accord with the College of Graduate Studies guidelines.

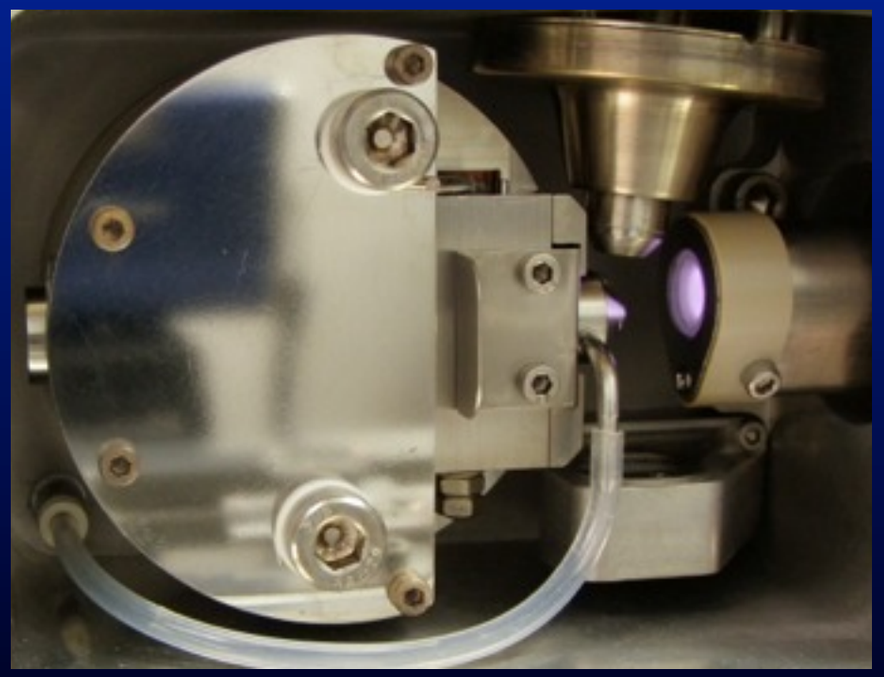
Carter Thesis Update

Overview

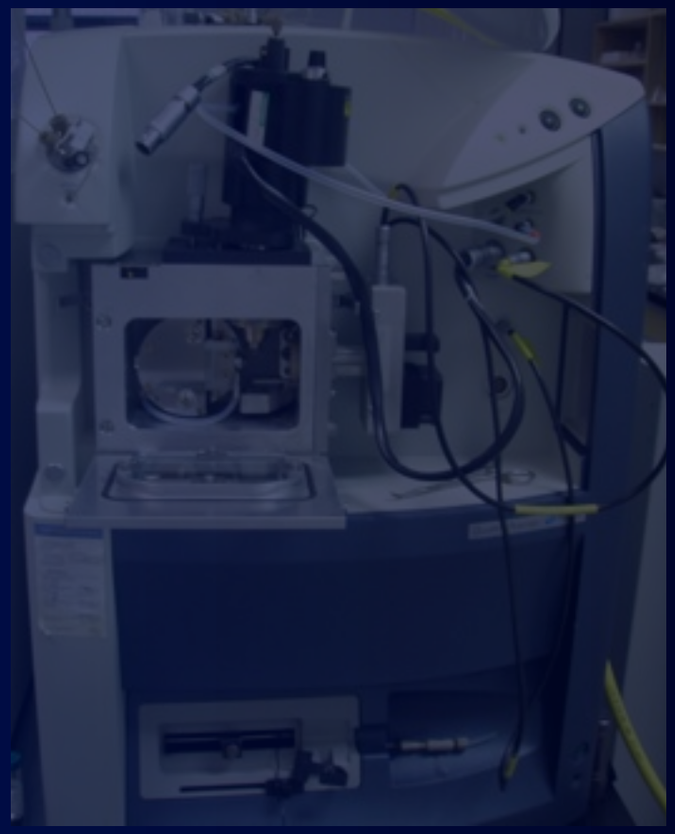
- APPI

- Thesis Focus

- Timeline

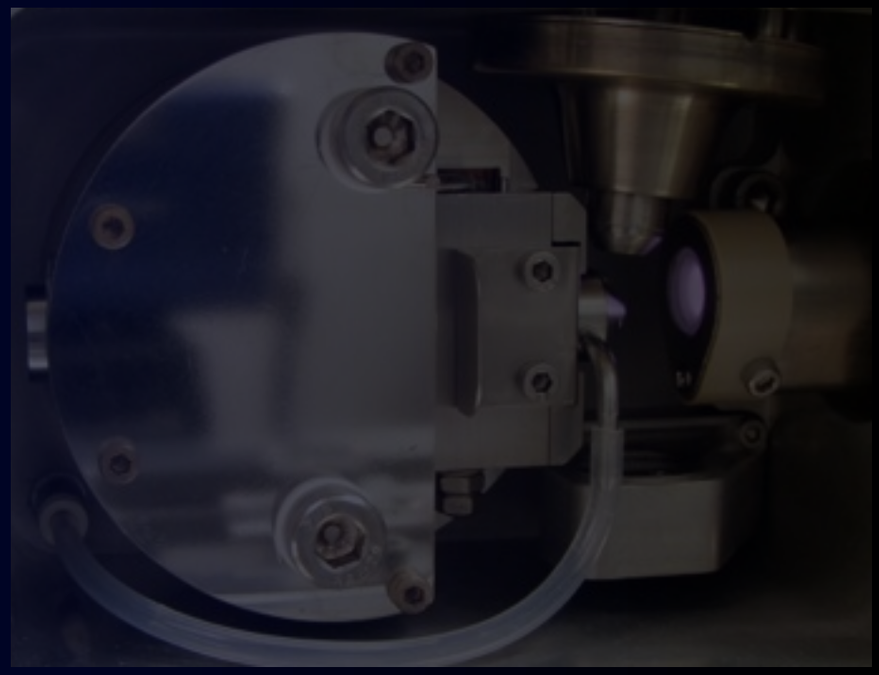


Waters MS/MS



Waters MS/MS
naked

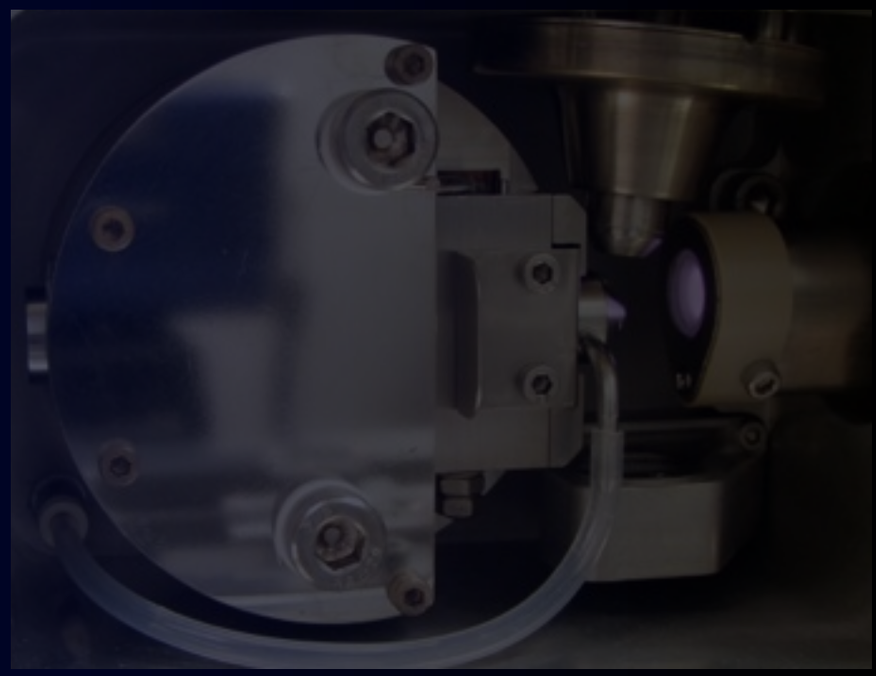
ionization chamber



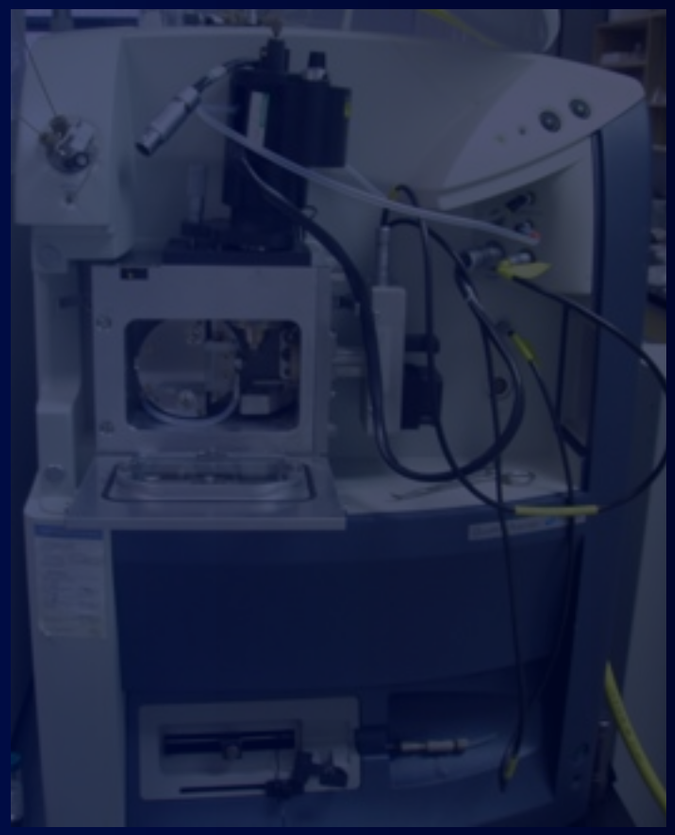
Waters MS/MS

Waters MS/MS
naked

ionization chamber



Waters MS/MS



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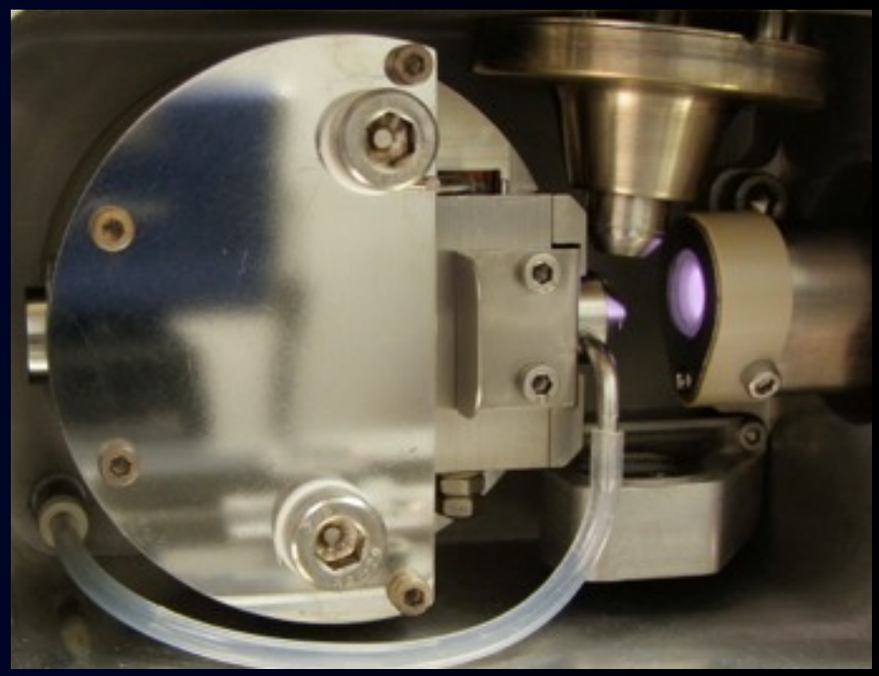
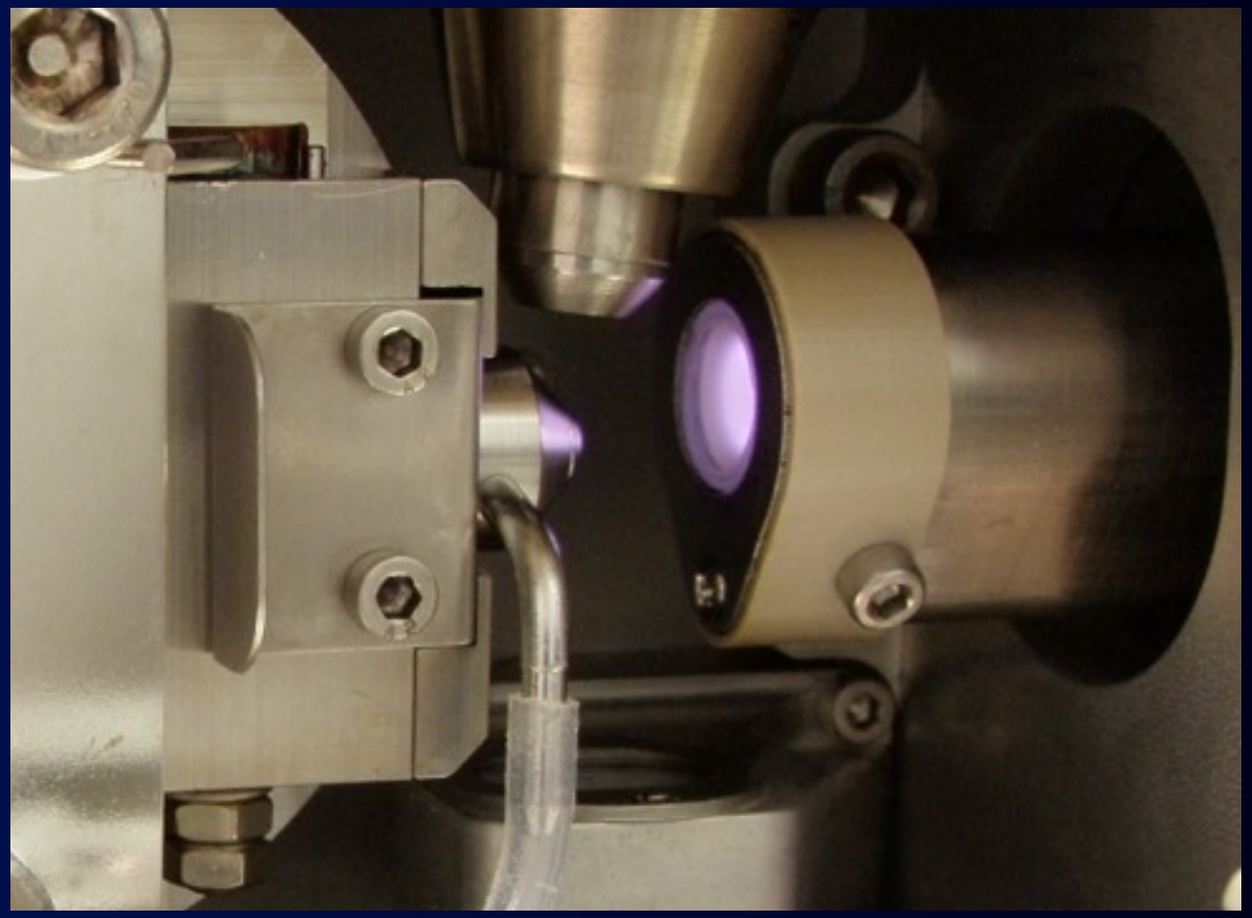
naked

ionization chamber



Atmospheric Pressure Photo ionization

APPI - electrical discharge in Krypton



Atmospheric Pressure Photo ionization

Ions formed cold (excess energy in the departing electron)
stable molecular ion

True ionization technique (ESI ion atomization)

Not as matrix dependent (APCI)

Photo Induced Chemical Ionization (PICI) radicals underestimated

With solvent: $M+H^+$
without Solvents mostly M^+

Carter Thesis Focus

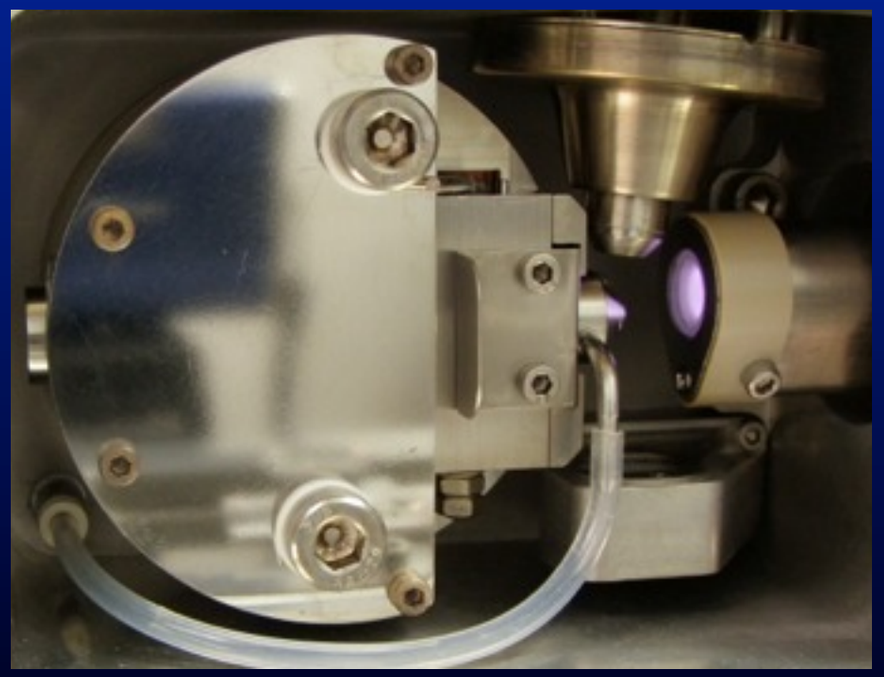
Direct sample introduction APPI MS/MS

Rapid analysis, no clean up, no separation

- TAVI-APPI

- Pyrolysis APPI

- Reducing chaotic flows in source

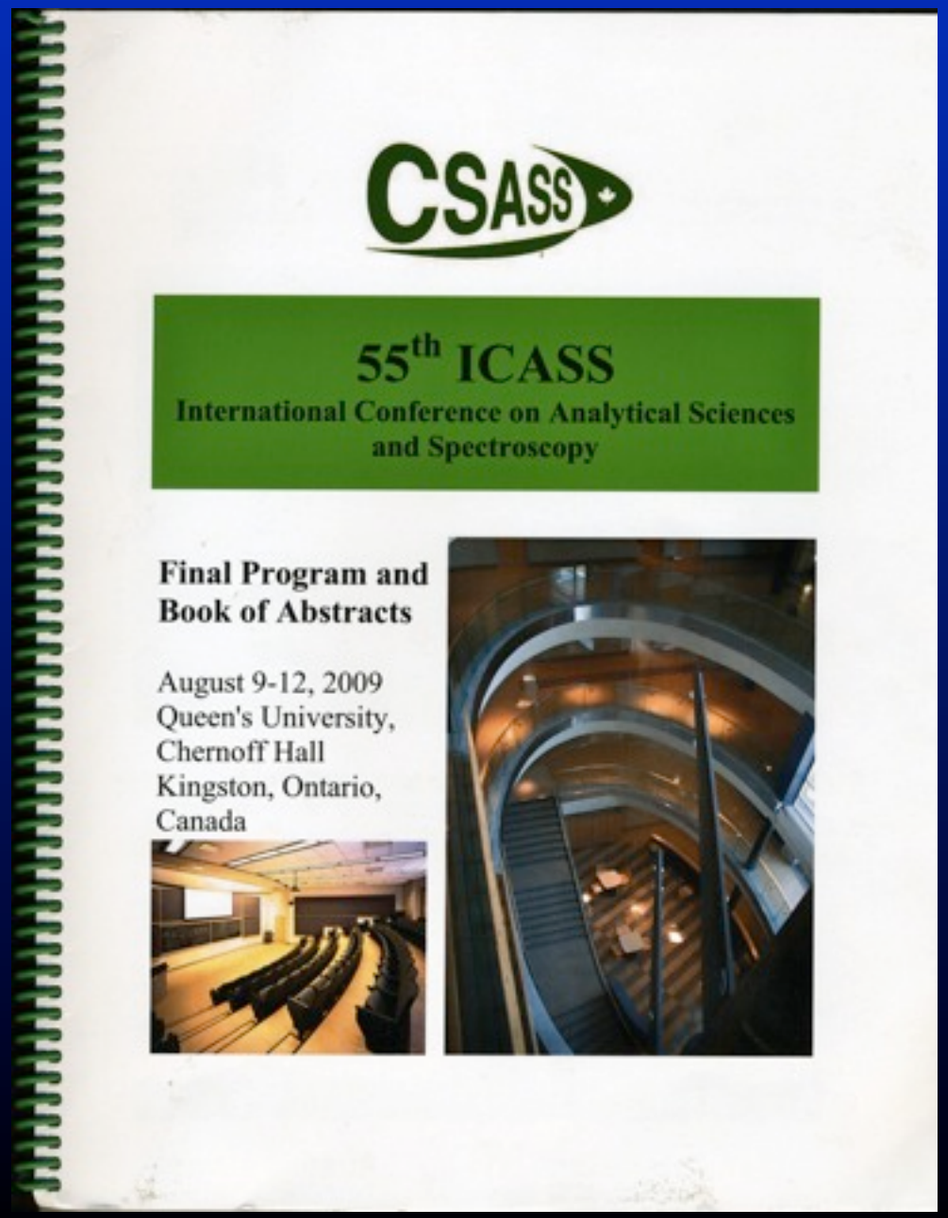


Carter Thesis Focus - TAVI - APPI

Winner

Oral presentation ICASS ’09, Queen’s, Kingston

Awarded top prize for best student presentation



Okanagan Regional Chemical Analysis Centre
The University of BC | Okanagan
www.orcac.ca

Thermally Assisted Vapour Introduction Atmospheric Pressure Photoionization MS/MS (TAVI APPI MS/MS)

Davin Carter [1], Hendrik Kersten [2], Thorsten Benter [2], Rob O'Brien [1]

[1.)] Okanagan Regional Chemical Analysis Centre, University of British Columbia Okanagan
[2.)] Department of Physical and Theoretical Chemistry, University of Wuppertal

CSASS 2009

Aug. 12, 2009

Specific Analytical Challenge

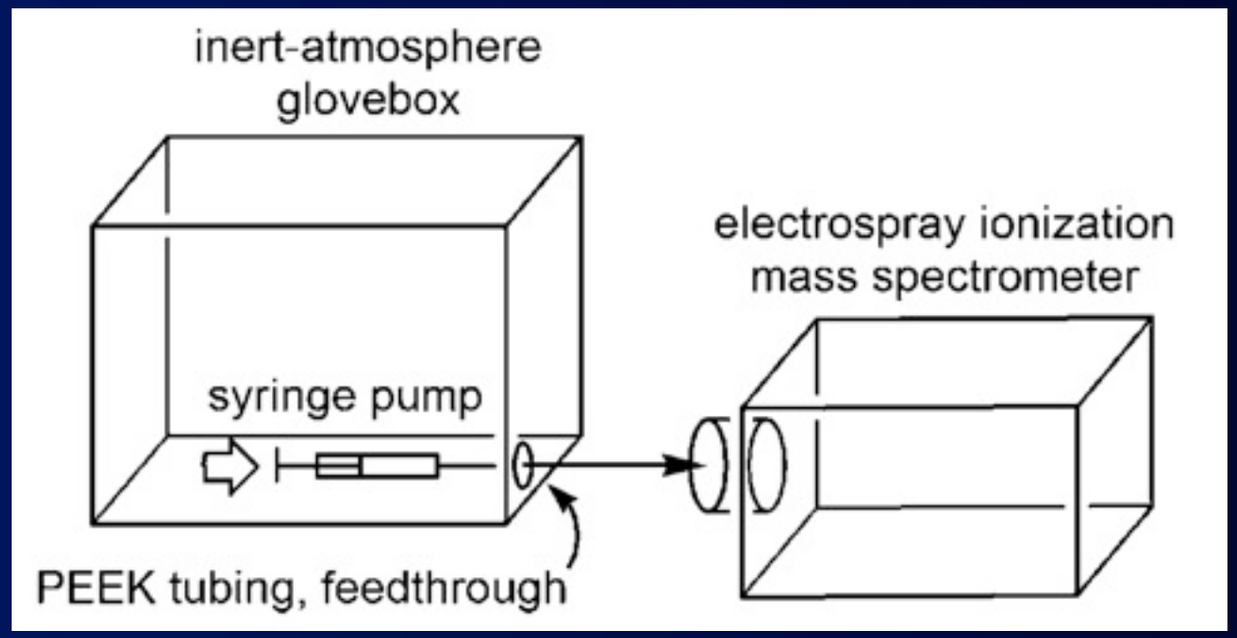
Synthetic, specifically inorganic, chemists needed quick confirmation of synthesis

Some compounds insoluble usual solvents

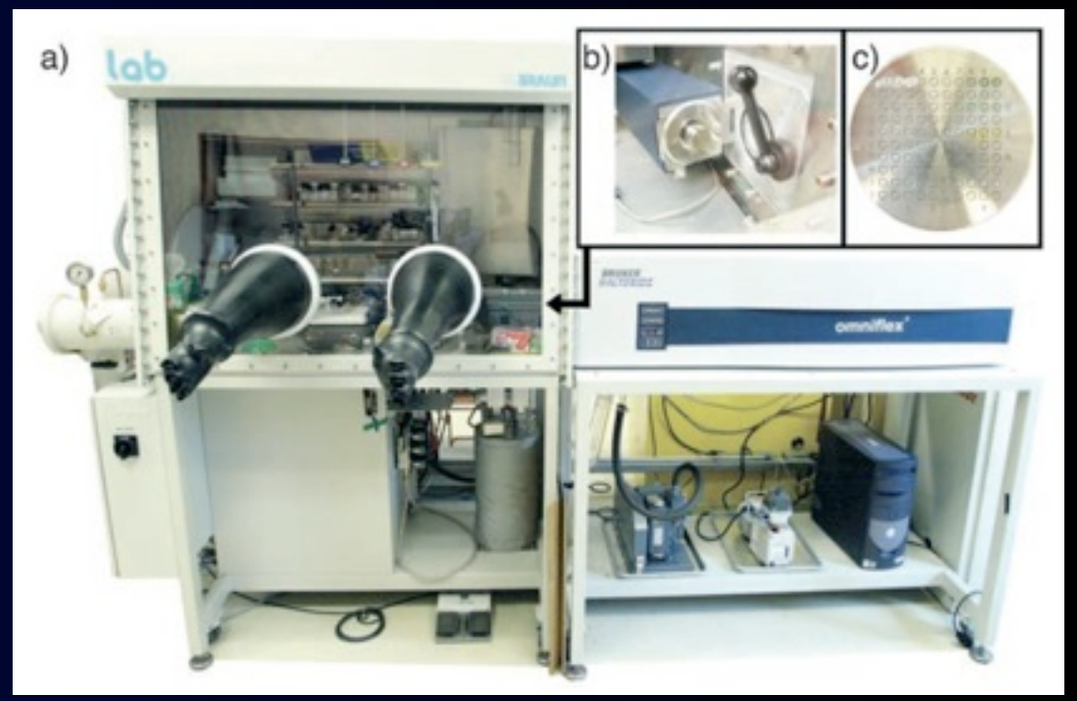
Noticed target compounds had aromaticity

Inorganic uses of MS

Some recently reported apparatus



Samples Dissolved in DCM
ESI MS McIndoe (U. Vic)



MALDI- TOF
Fogg (U of O.)

APPI mechanisms

Primary APPI

$h\nu + A \rightarrow \mathbf{A^+} + e^-$ photoionization (+) tive

Secondary APPI (PICI)

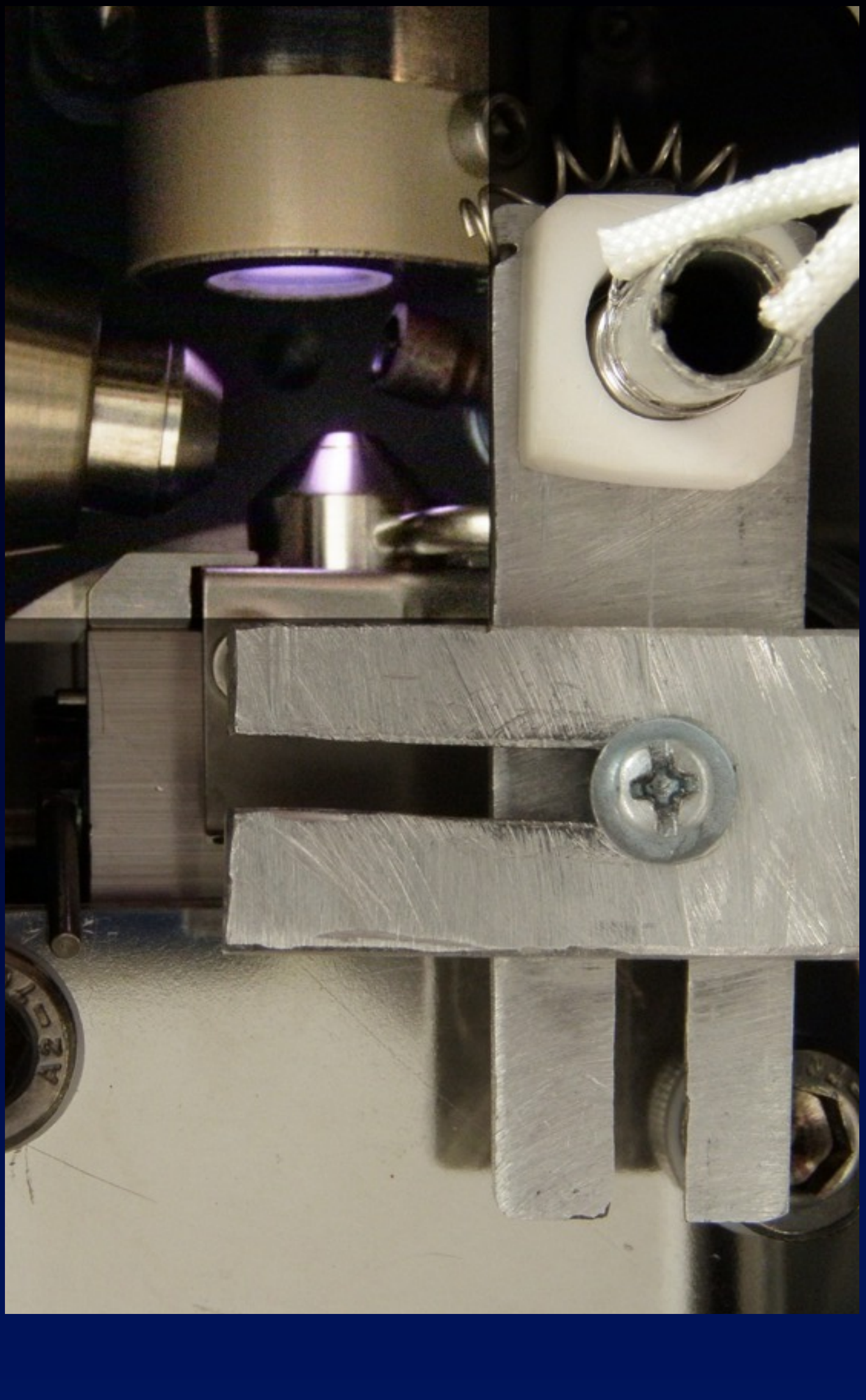
$h\nu + D \rightarrow D^+ + e^- \rightarrow D^+ + A \rightarrow A^+ + D$ dopant assisted (+) tive

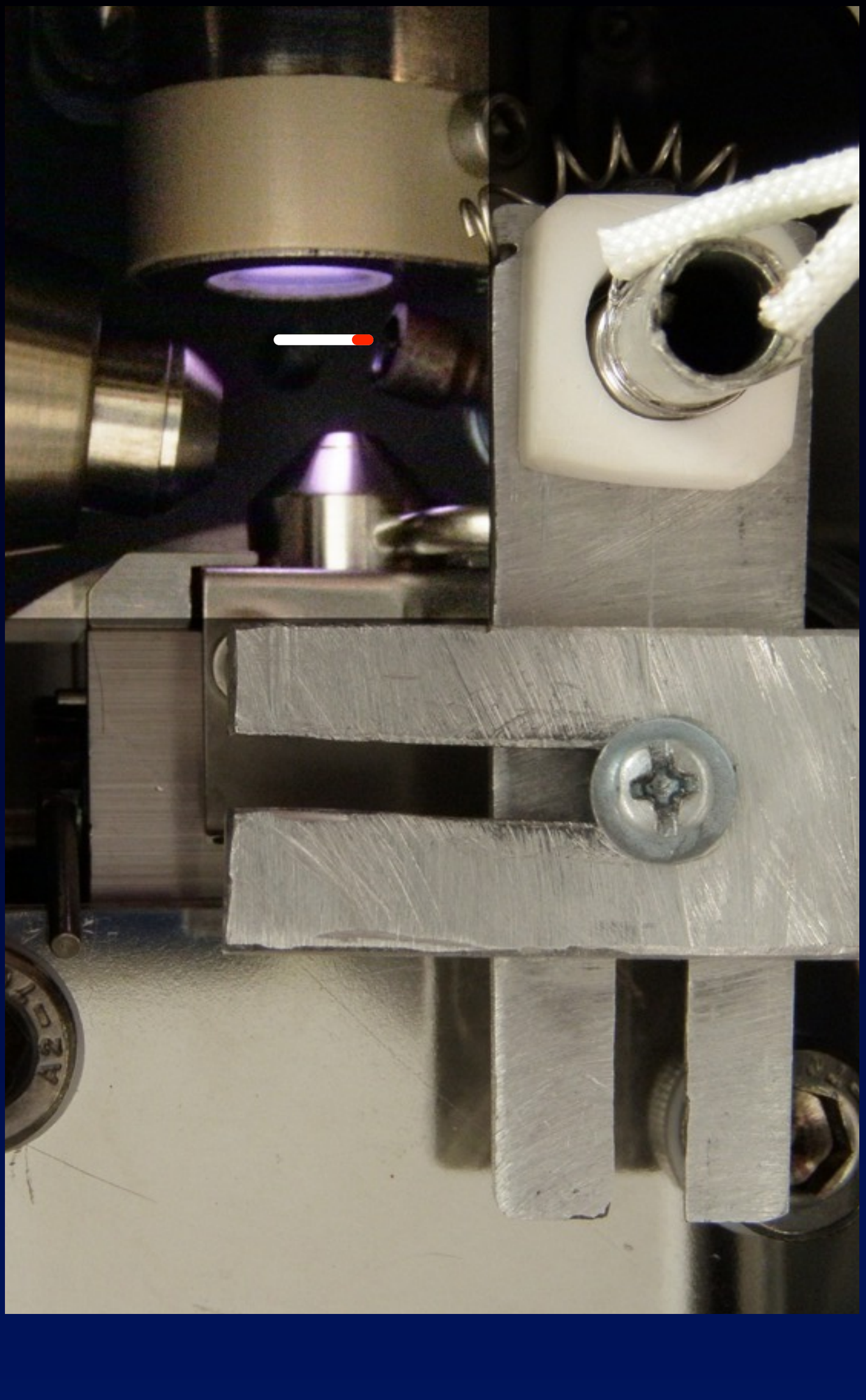
$e^- + D \rightarrow D^- \rightarrow D^- + A \rightarrow A^- + D$ dopant assisted (-) tive

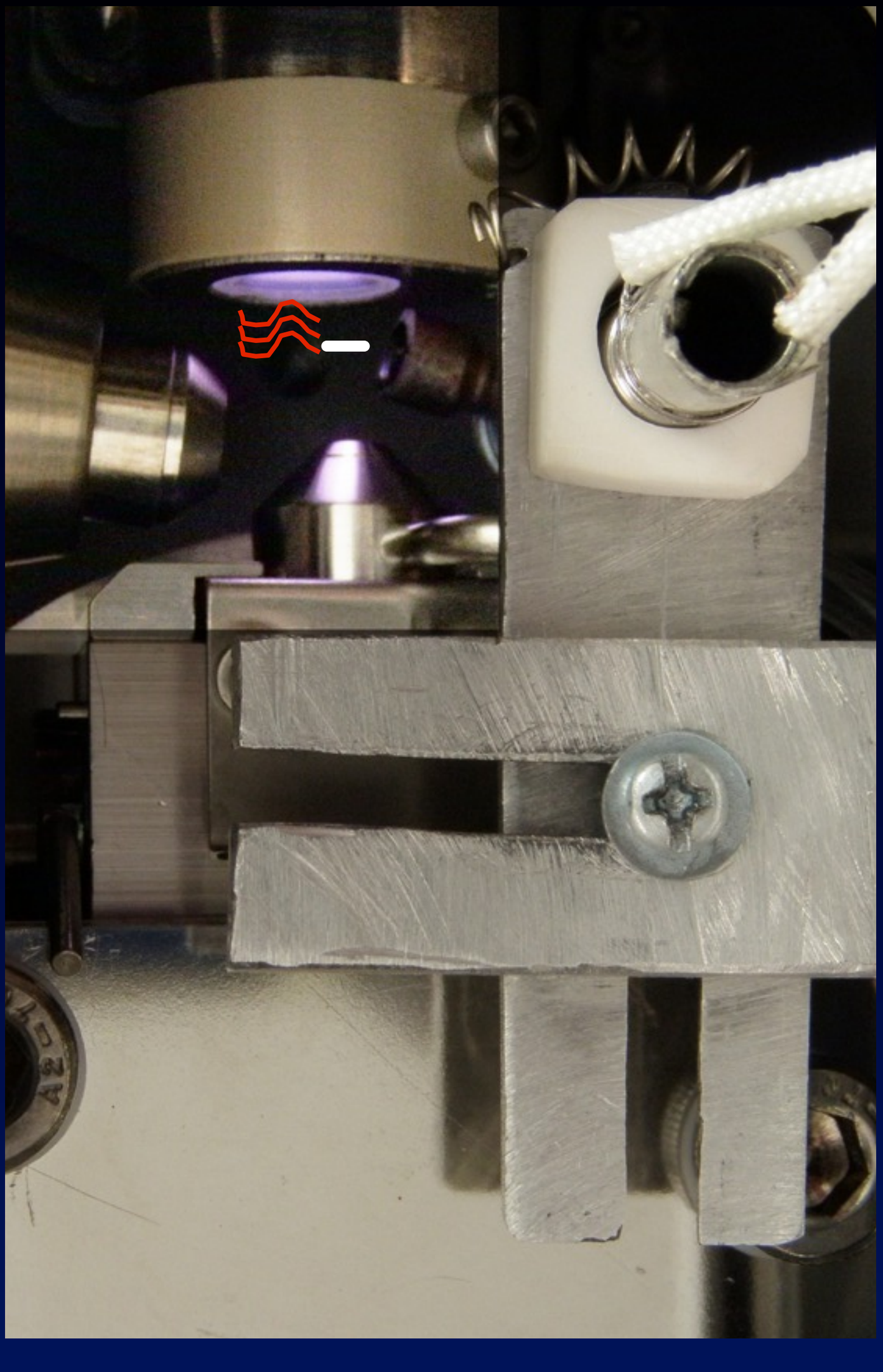
$e^- + A \rightarrow A^-$ photo induced e^- capture (-) tive

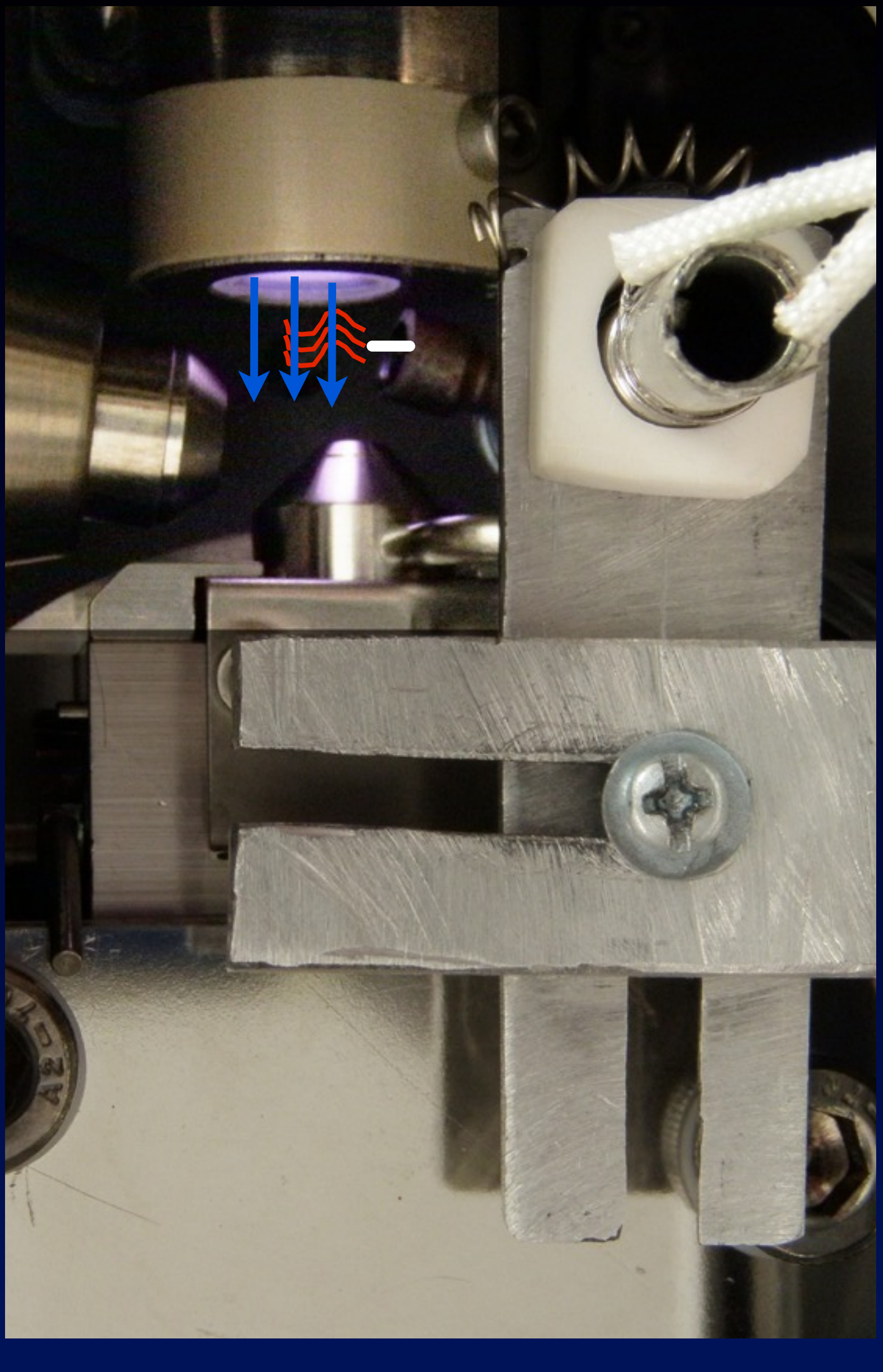
$h\nu + C_7H_8 \rightarrow C_7H_8^{\bullet+} + e^- \rightarrow C_7H_8^{\bullet+} + (CH_3OH)_3 \rightarrow C_7H_7^{\bullet} + (CH_3OH)_3H^+$

$(CH_3OH)_3H^+ + A \rightarrow \mathbf{AH^+} + 3CH_3OH$

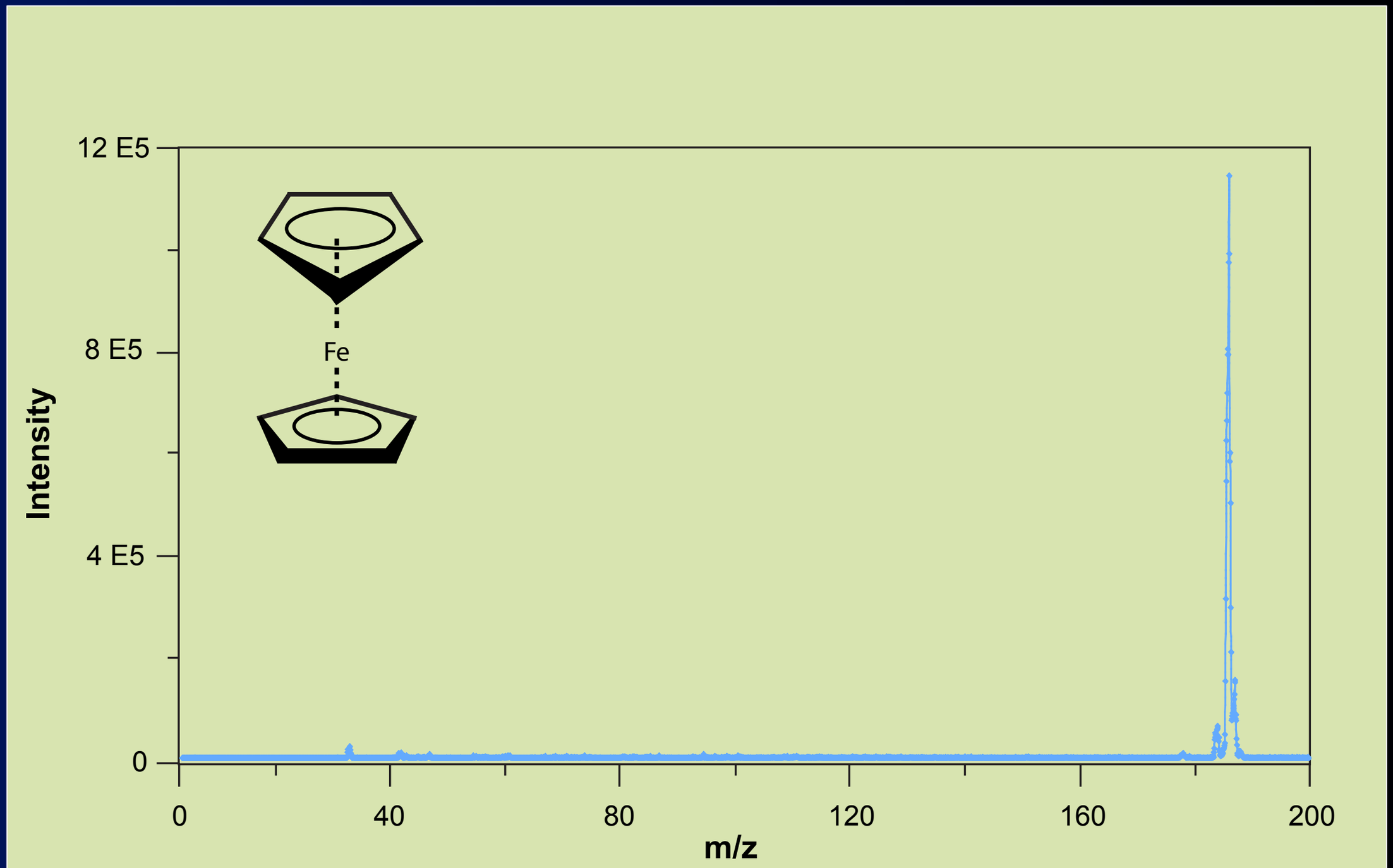




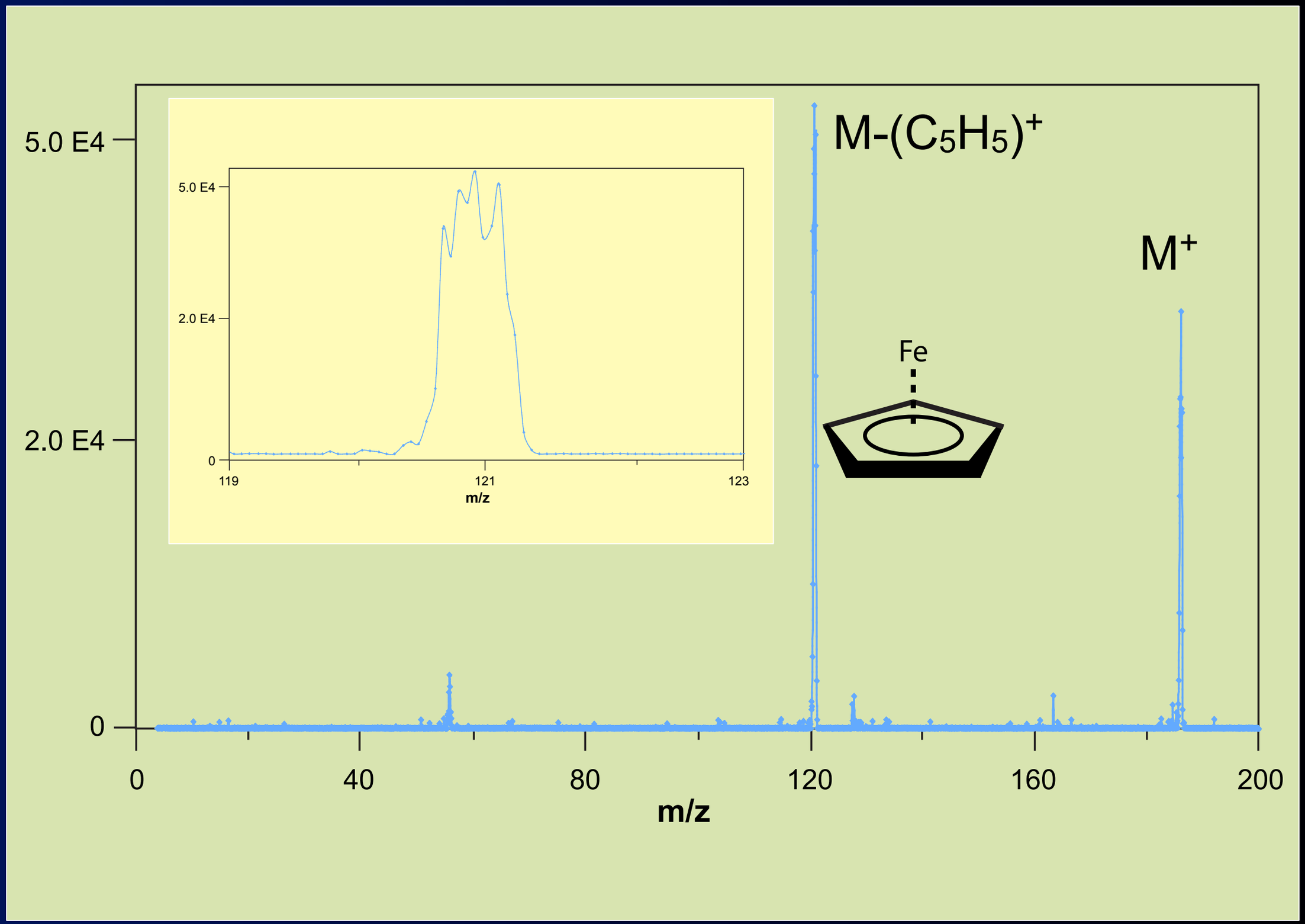




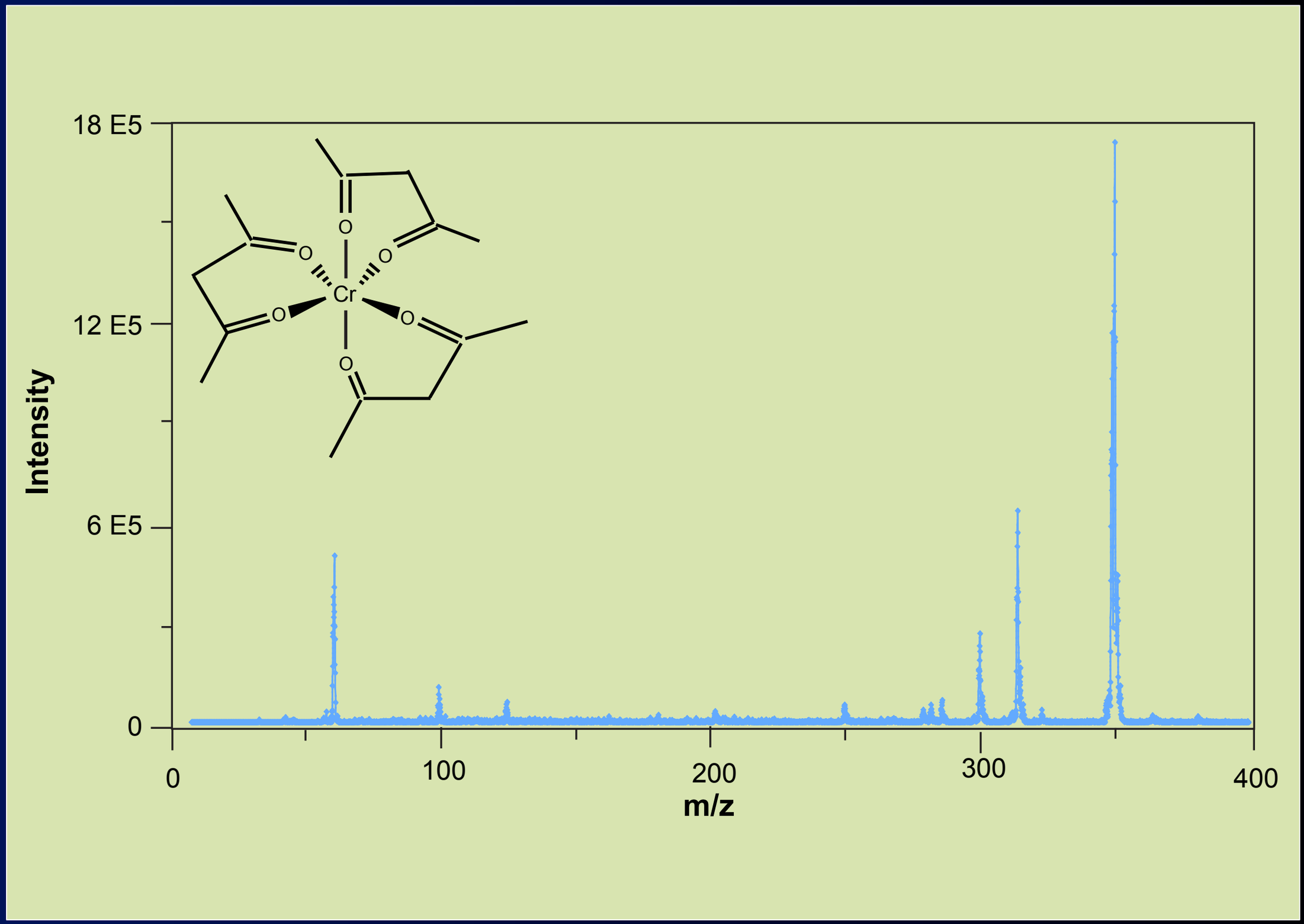
Ferrocene $Fe(C_5H_5)_2$ 186.04 g/mol



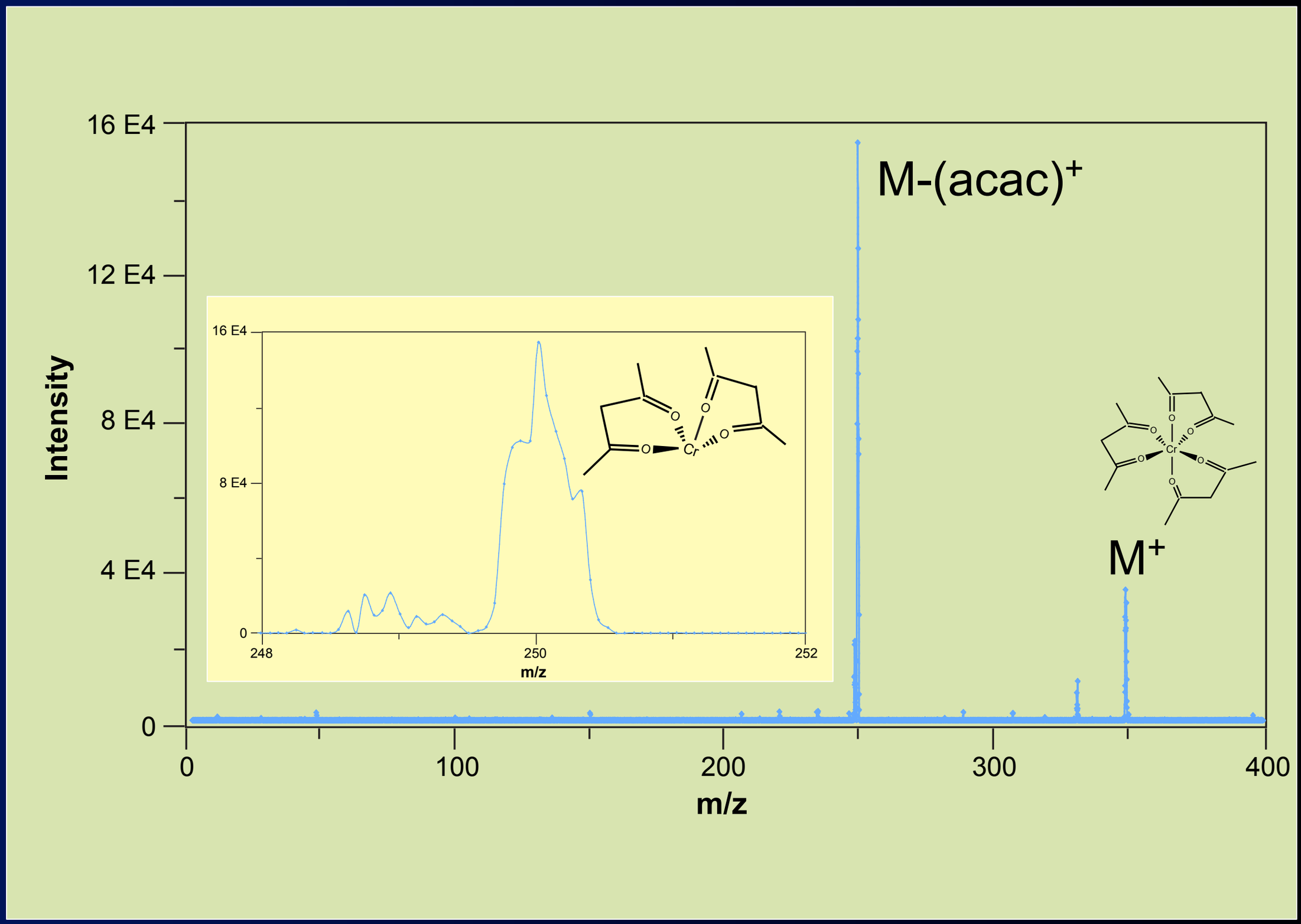
MS/MS of Ferrocene $Fe(C_5H_5)_2$ 186.04 g/mol



$Cr(acac)_3$ 349.3 g/mol

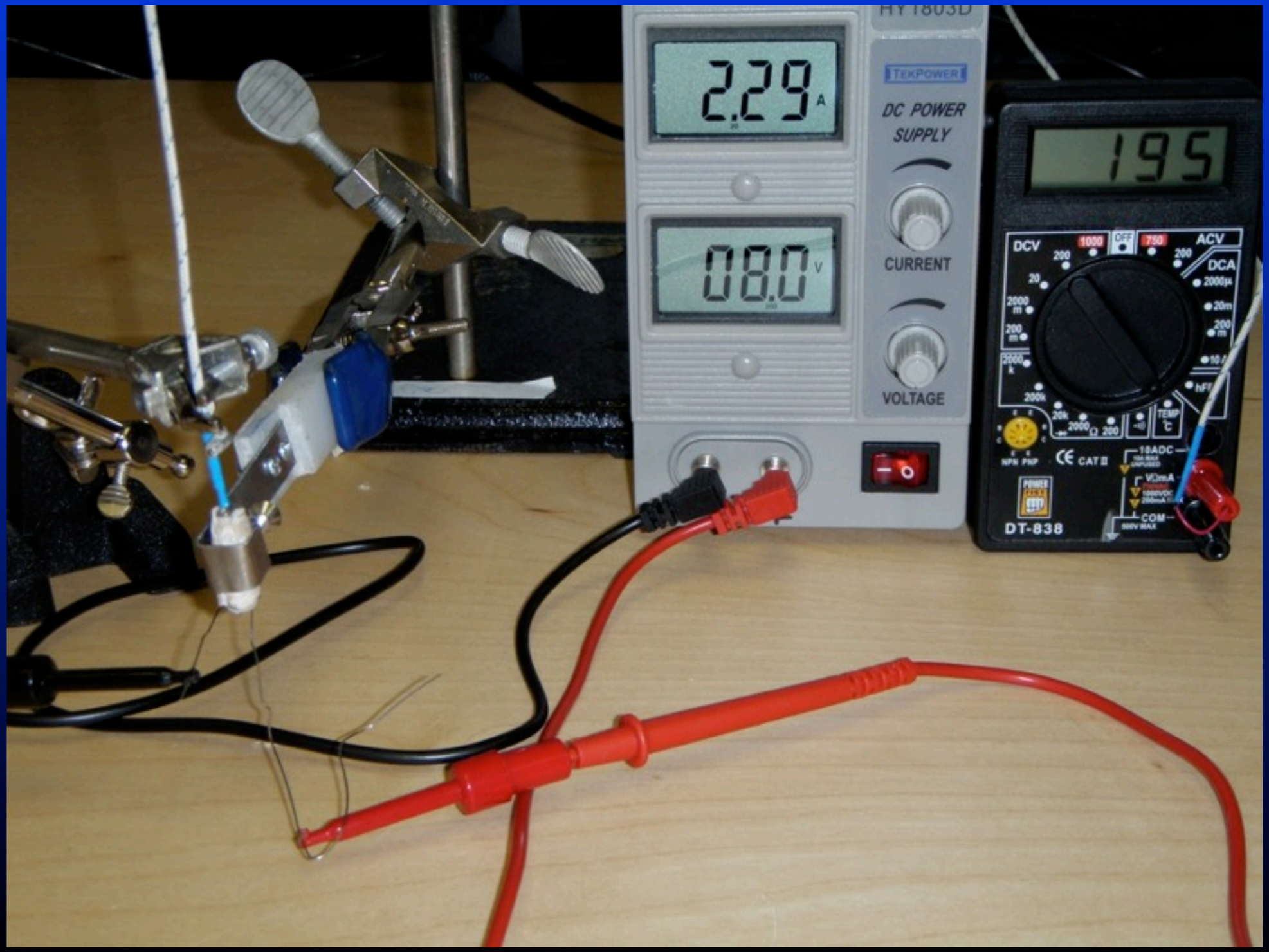


MS/MS of $Cr(acac)_3$ 349.3 g/mol

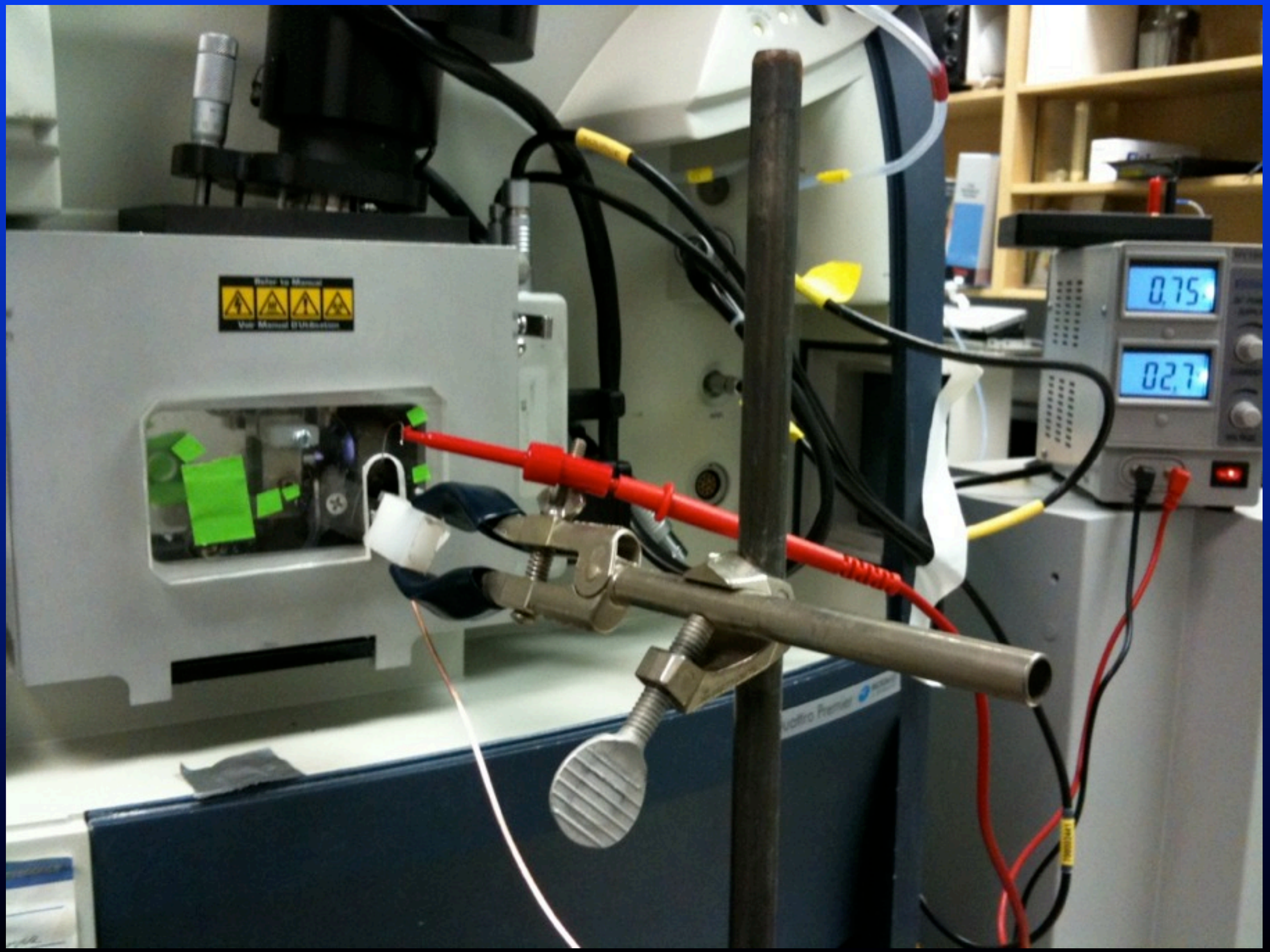


Carter Thesis Focus - Pyrolysis - APPI

Design 1: Resistive heating via Nichrom wire coil

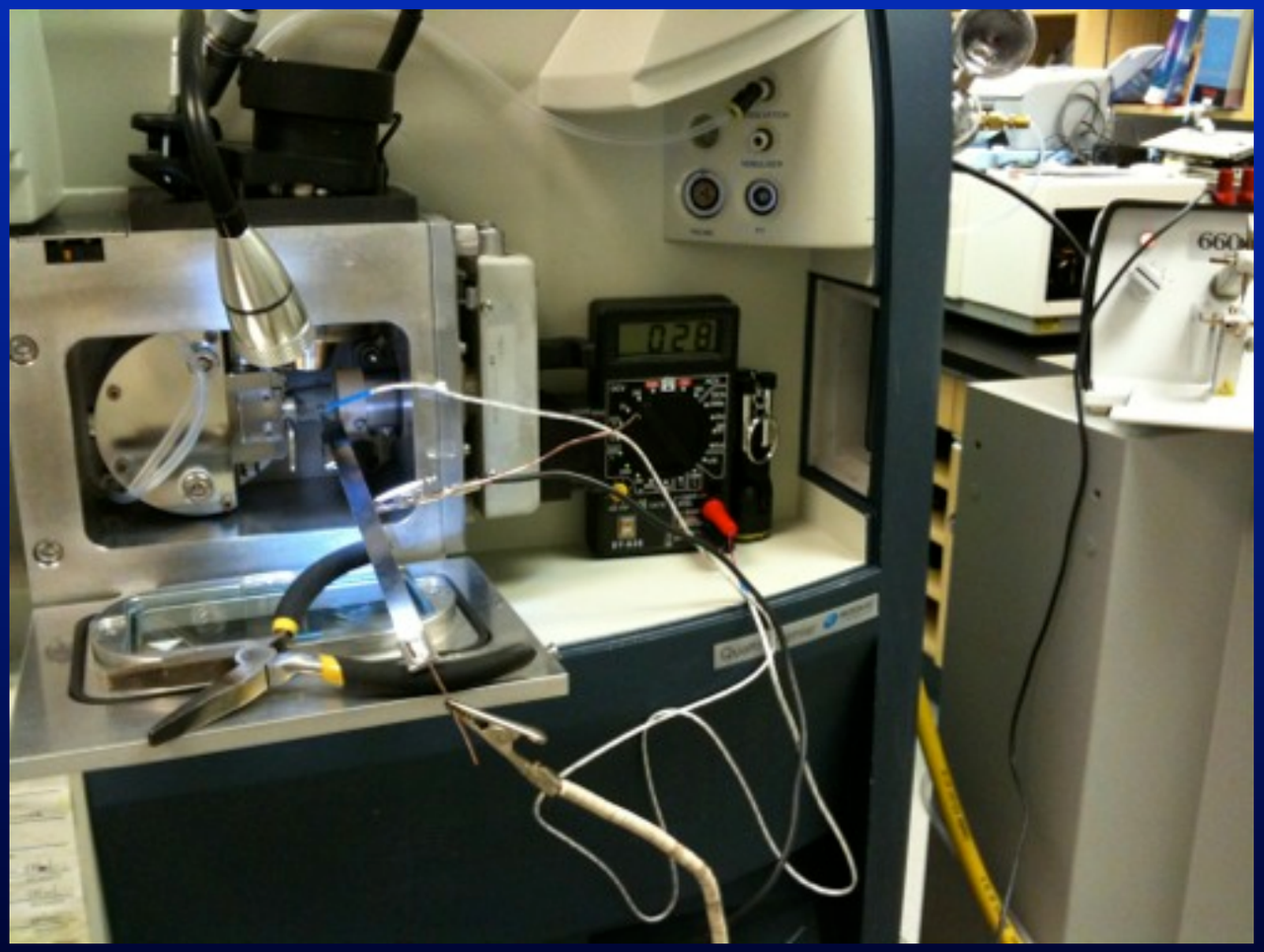


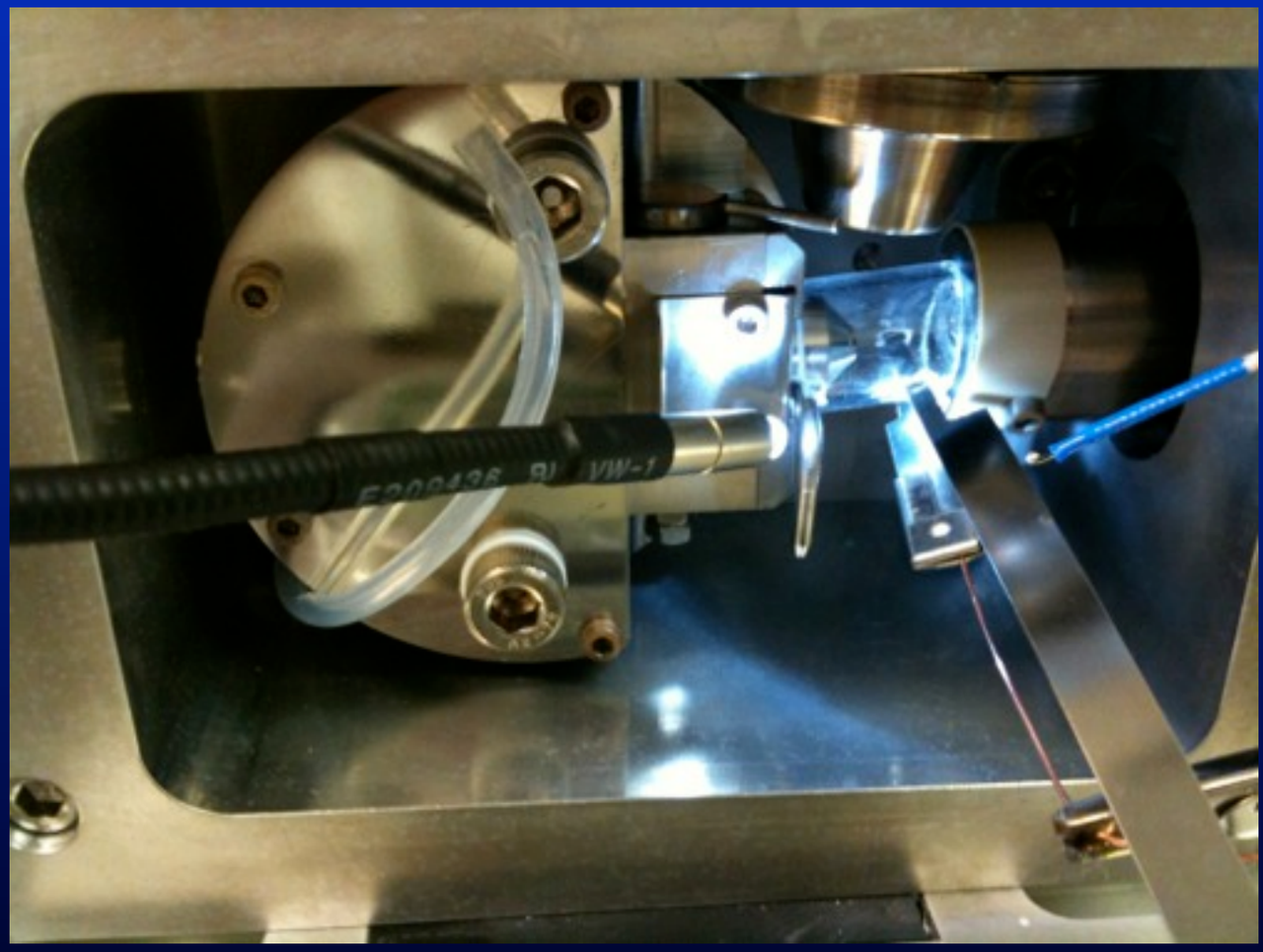
Carter Thesis Focus - Pyrolysis - APPI



Carter Thesis Focus - Pyrolysis - APPI

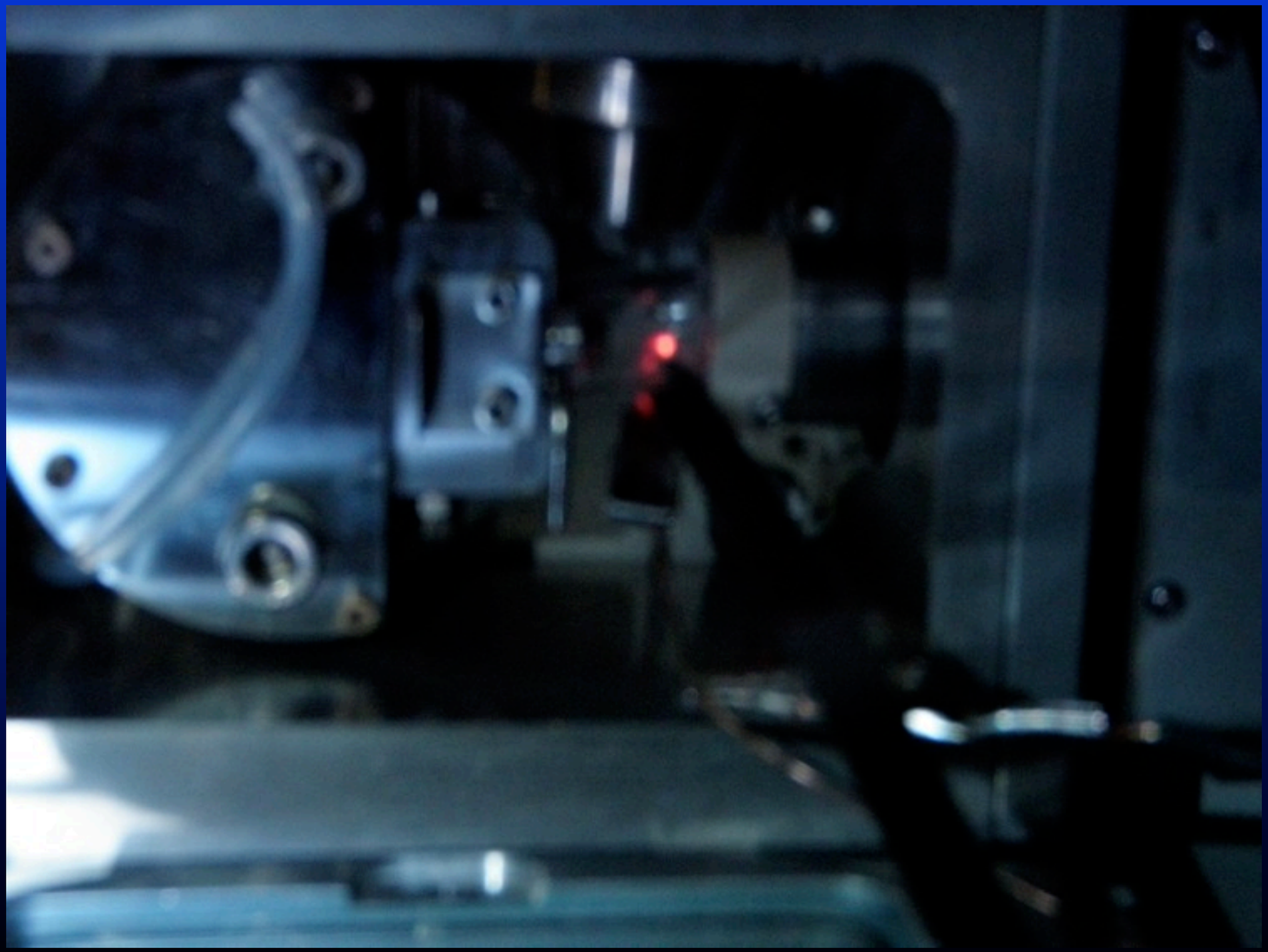
Design 2: Resistive heating stainless steel & spot welder



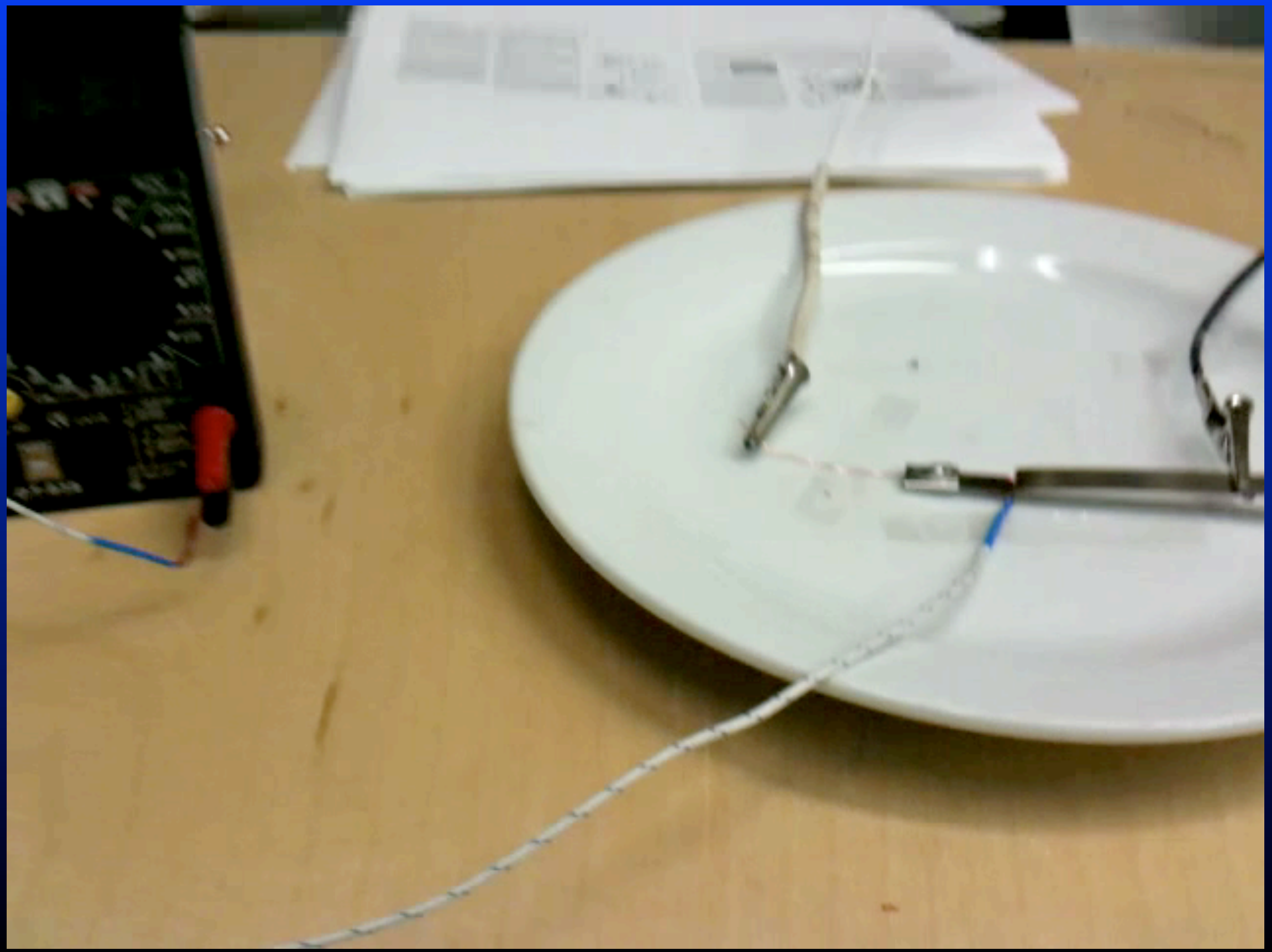


Carter Thesis Focus - Pyrolysis - APPI

Design 2: Resistive heating Stainless steel & spot welder

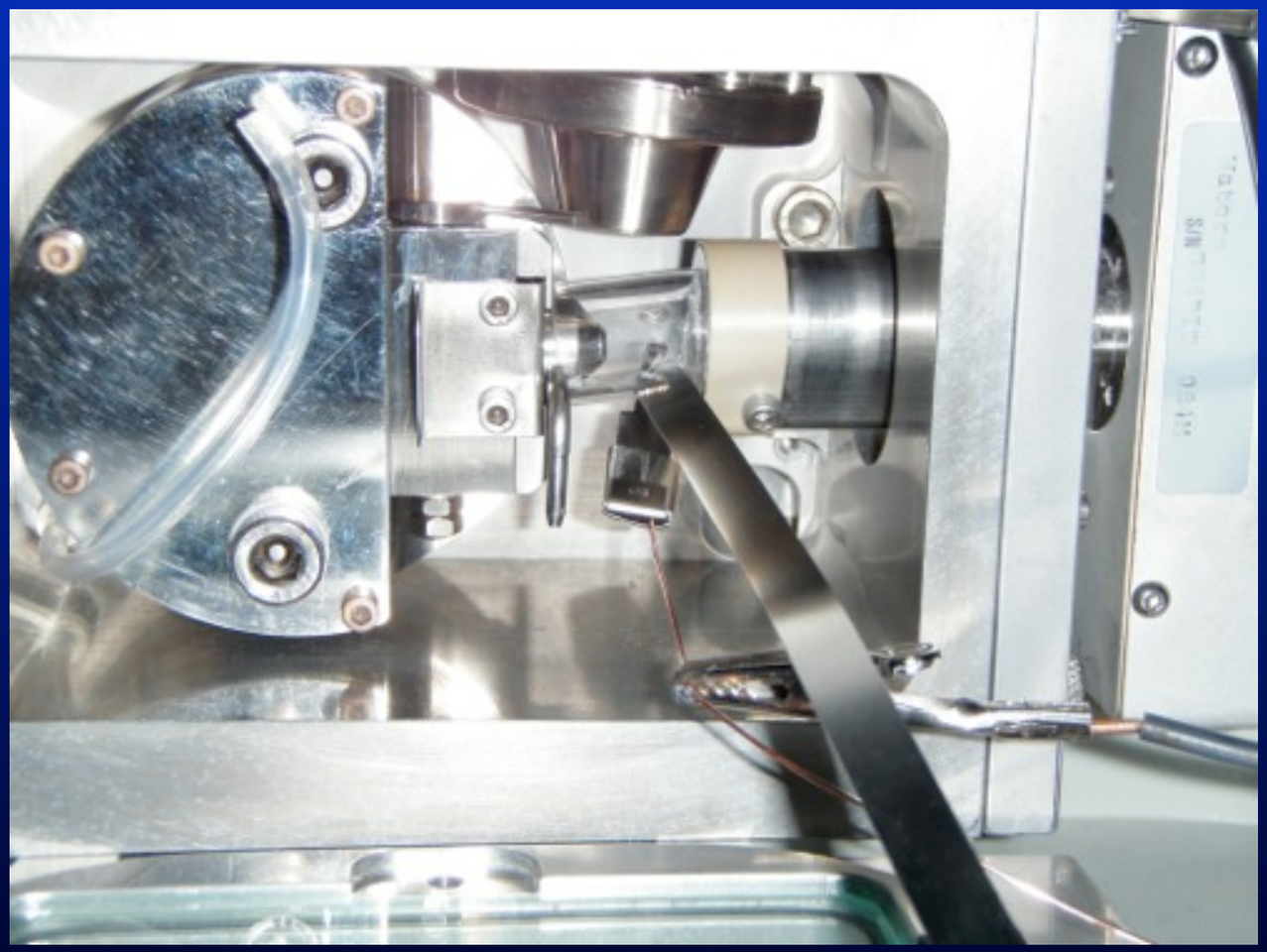


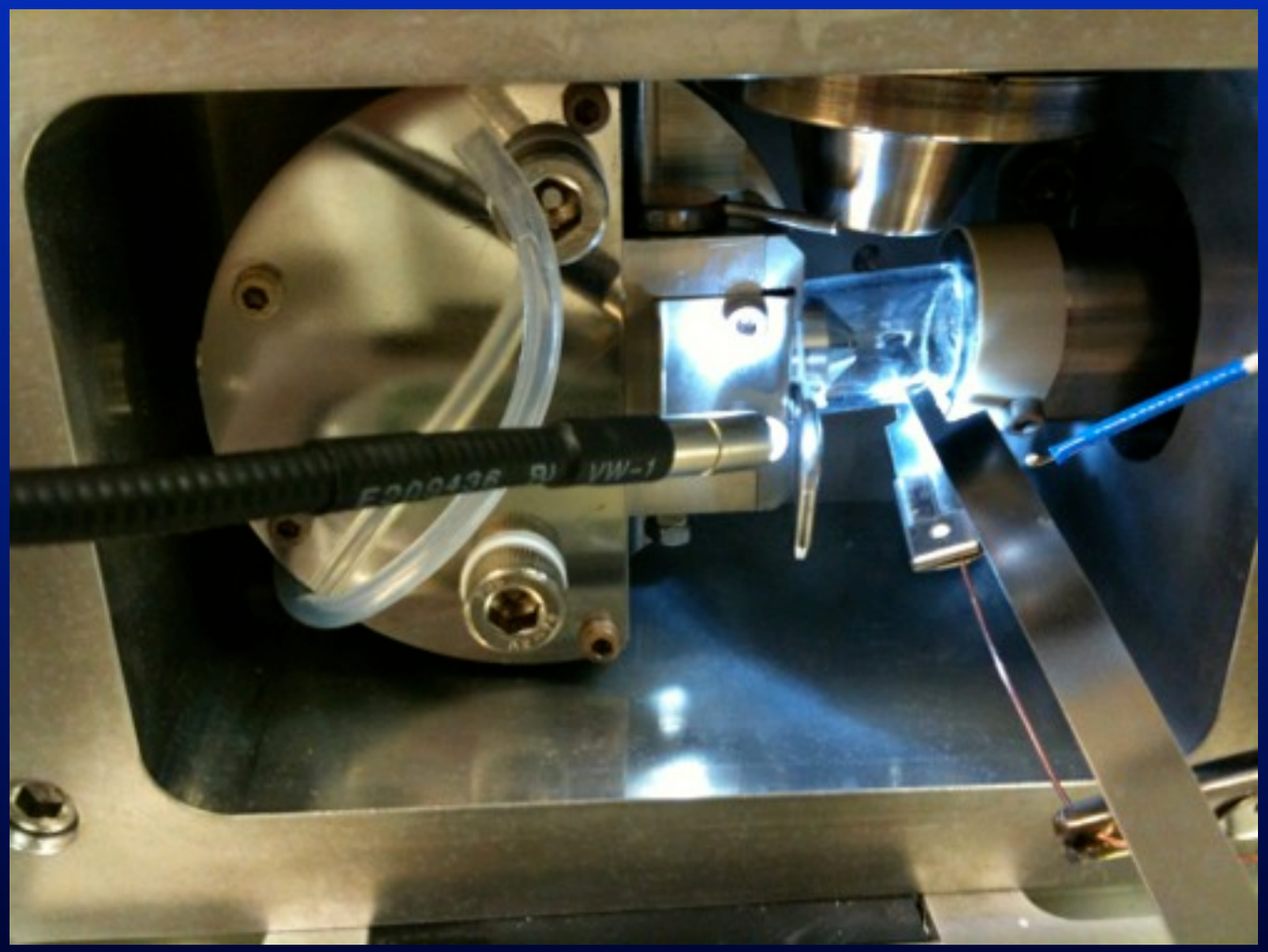
Carter Thesis Focus - Pyrolysis - APPI



Carter Thesis Focus - Source Flows

Reducing chaotic flows in source





Carter Thesis Focus

Direct sample introduction APPI MS/MS

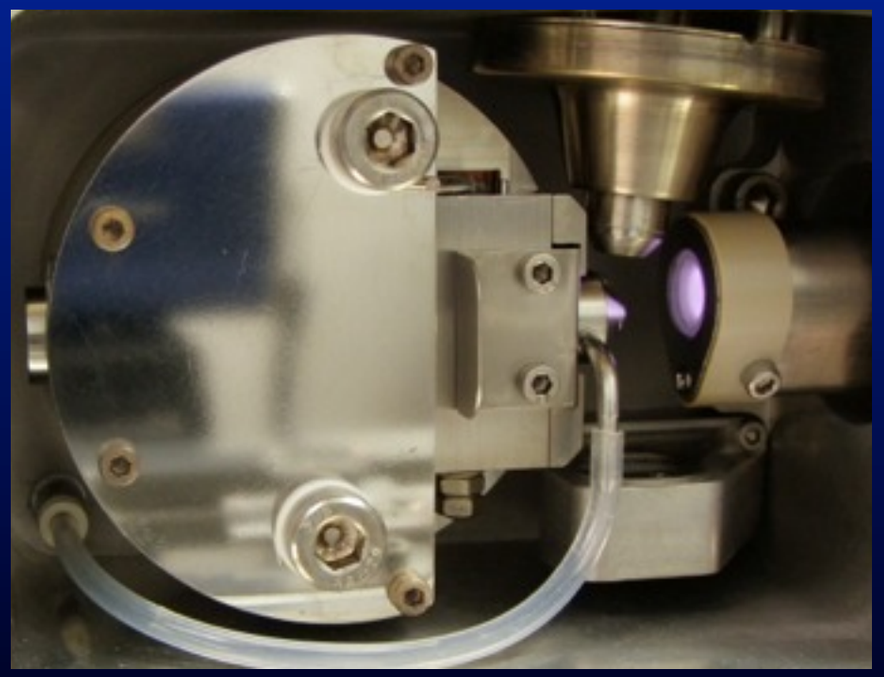
Rapid analysis, no clean up, no separation

- TAVI-APPI

- Pyrolysis APPI

- Reducing chaotic flows in source

Inexpensive, easy to adapt to existing instruments



Carter Thesis Timelines

January

S	M	T	W	Th	F	S
					1	2
3	4	5	6	7	8	9
10	11 Meeting	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27 Draft Intro	28	29	30
31						

Carter Thesis Timelines

February

S	M	T	W	Th	F	S
	1	2	3	4	5 Lab work done	6
7	8	9	10	11	12	13
14 Experimental Draft	15 Paperwork to CGS Spring finish	16	17	18	19	20
21	22	23	24	25	26	27
28						

Carter Thesis Timelines

March

S	M	T	W	Th	F	S
	1	2	3	4	5	6
7 Results Draft	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

Carter Thesis Timelines

April

S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Carter Thesis Timelines

May

S	M	T	W	Th	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					grad studies deadline June 15

Questions

Thank you

Davin Carter

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