GLASS EXPANSION
Quality By Design

Evaluation of Glass Expansion High Efficiency Sample Introduction System (HE-SIS)

World leaders in sample introduction systems for ICP-OES and ICP-MS

Introduction

- An Agilent Technologies® 7900 ICP MS was used in this evaluation.
- For this evaluation, plasma power and flow rates were kept constant.
- The sampling depth of 8mm was optimized via autotune and used for all of the experiments.
- A precision syringe drive was used to introduce the sample.
- A Glass Expansion TruFlo sample monitor was used to measure actual sample flows.

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Agilent® 7900 ICP MS Instrument Conditions

Name	‘No Gas’ Mode	Unit
RF Power	1550	W
Sampling Depth	8	mm
Plasma Gas Flow Rate	15	L/min
Auxiliary Gas Flow Rate	0.9	L/min
Nebulizer Gas Flow Rate	0.25, 0.30, 0.35, 0.40 and 0.45	L/min
Makeup Gas Flow Rate	0.80, 0.75, 0.70, 0.65 and 0.60	L/min
Total Injector Gas Flow Rate	1.05	L/min
Pump Tubing	Orange/Black	0.13mm ID
Peristaltic Pump Rate	12	rpm
Sample Flow Rate	~15	µL/min
Extract Lens 1	0	V
Extract Lens 2	-195	V
Omega Lens Bias	-80	V
Omega Lens	10.2	V
Cell Entrance	-30	V
Cell Exit	-50	V
Deflect	14.4	V
Plate Bias	-35	V

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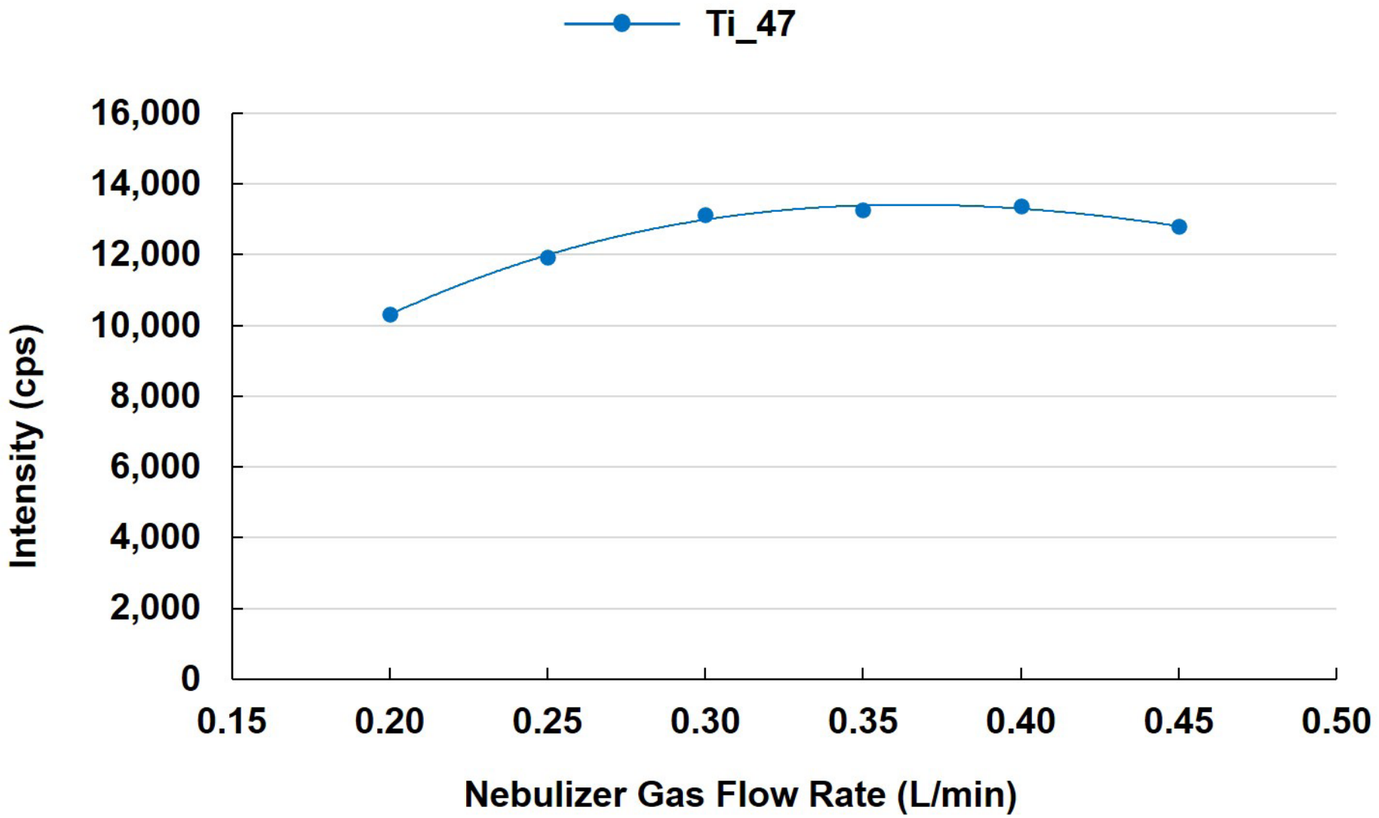
Optimization of Nebulizer Gas Flow Rate - Low Mass



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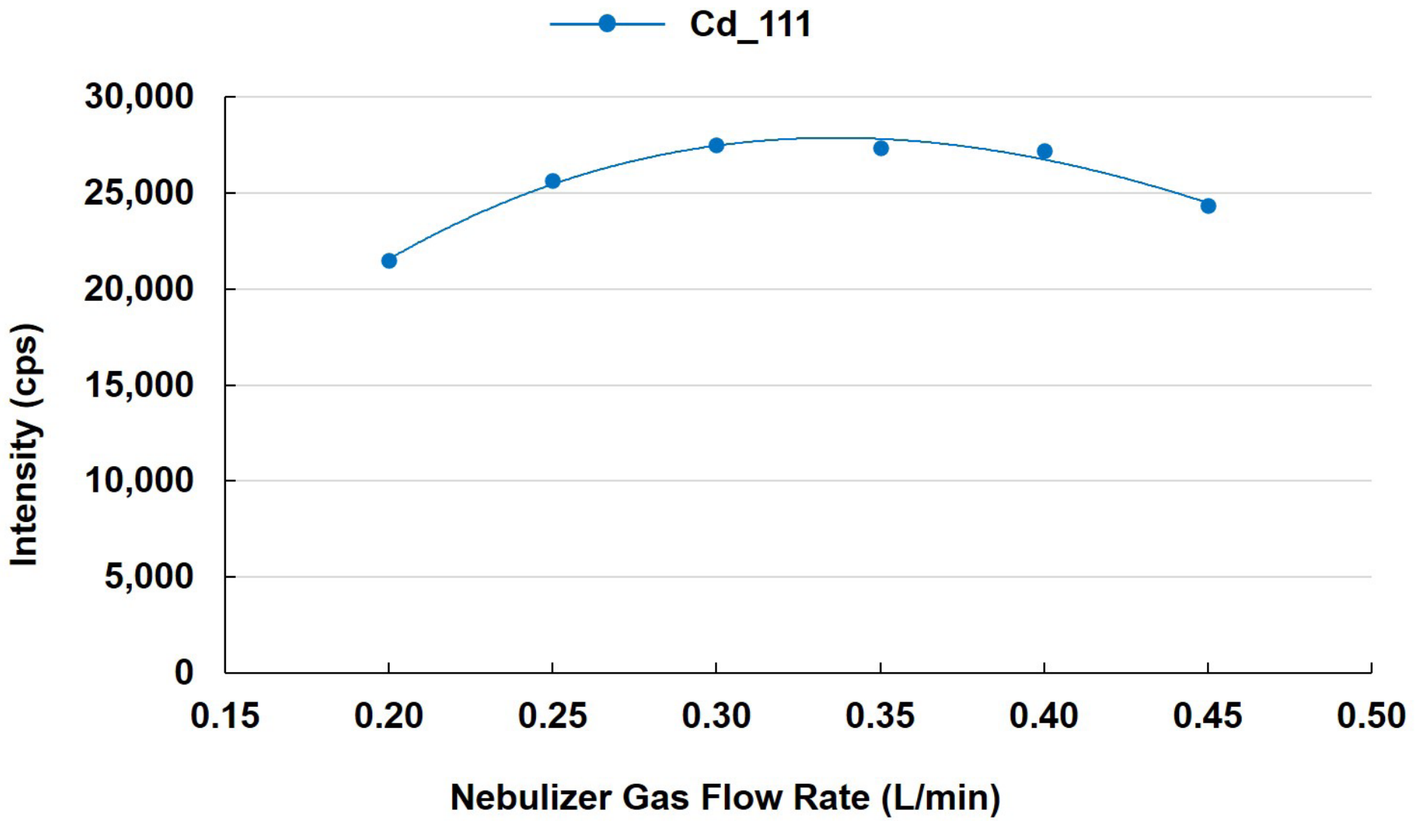
Optimization of Nebulizer Gas Flow Rate - Mid Mass



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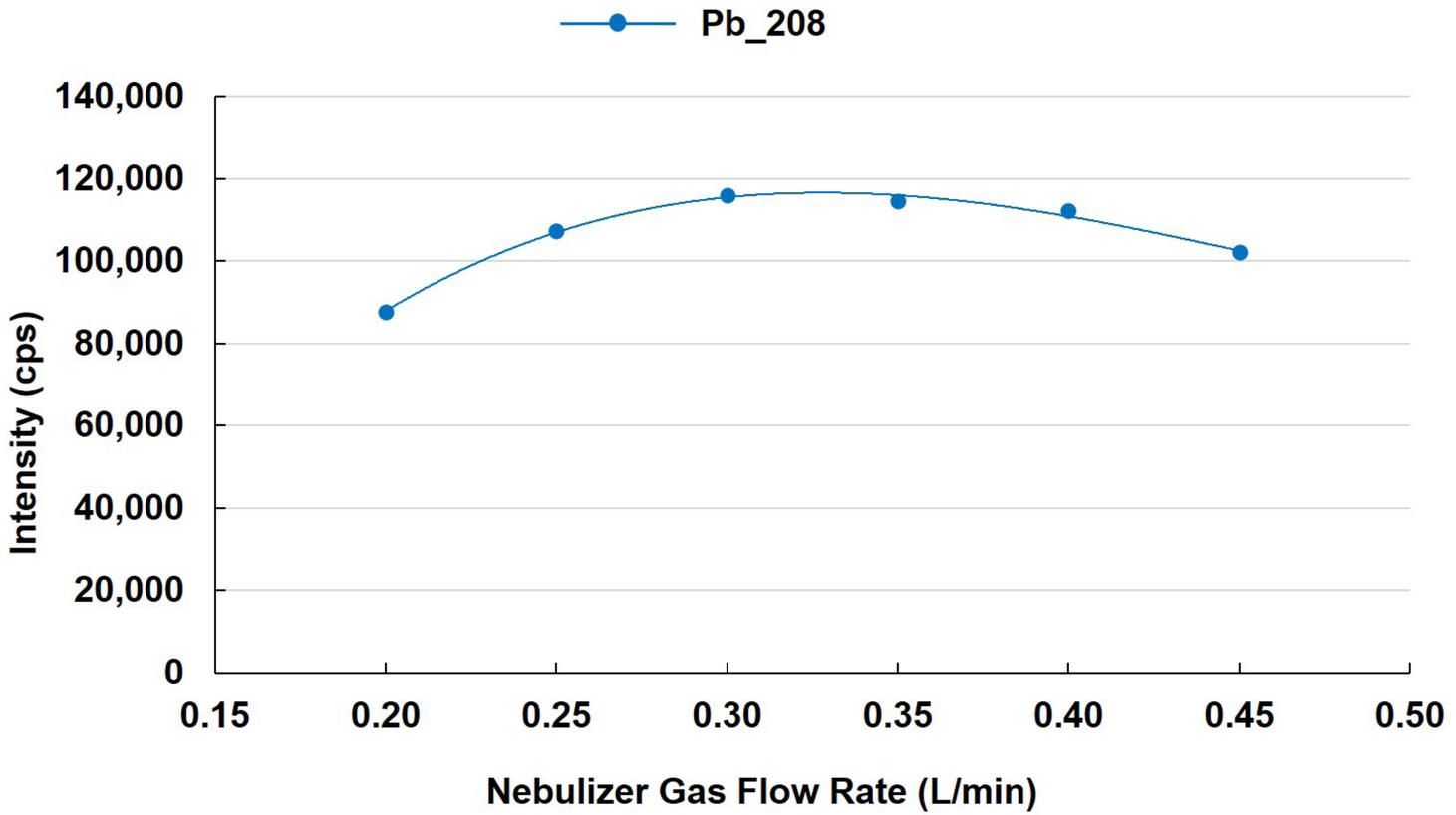
Optimization of Nebulizer Gas Flow Rate - High Mass



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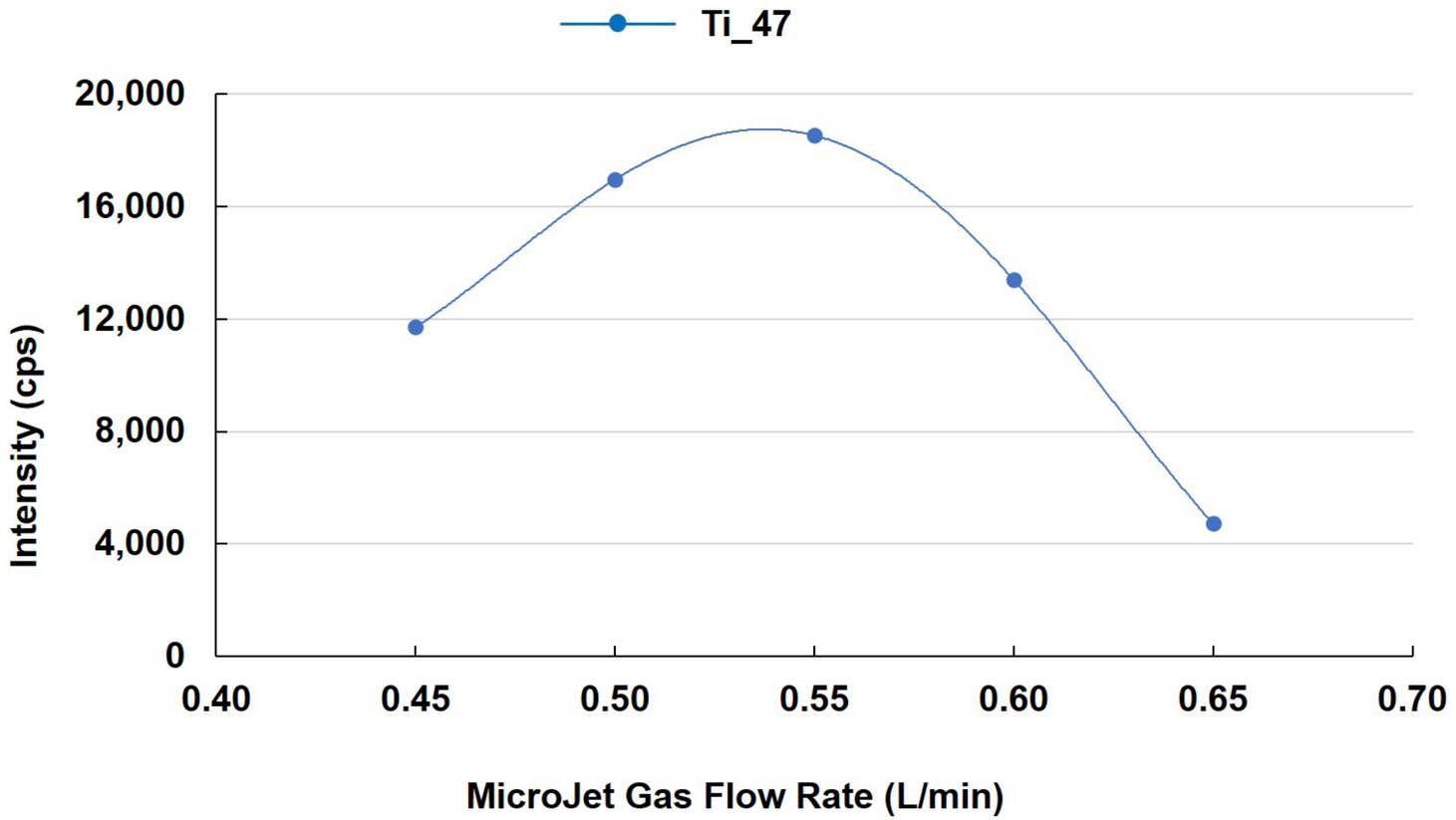
Optimization of MicroJet Gas Flow Rate - Low Mass



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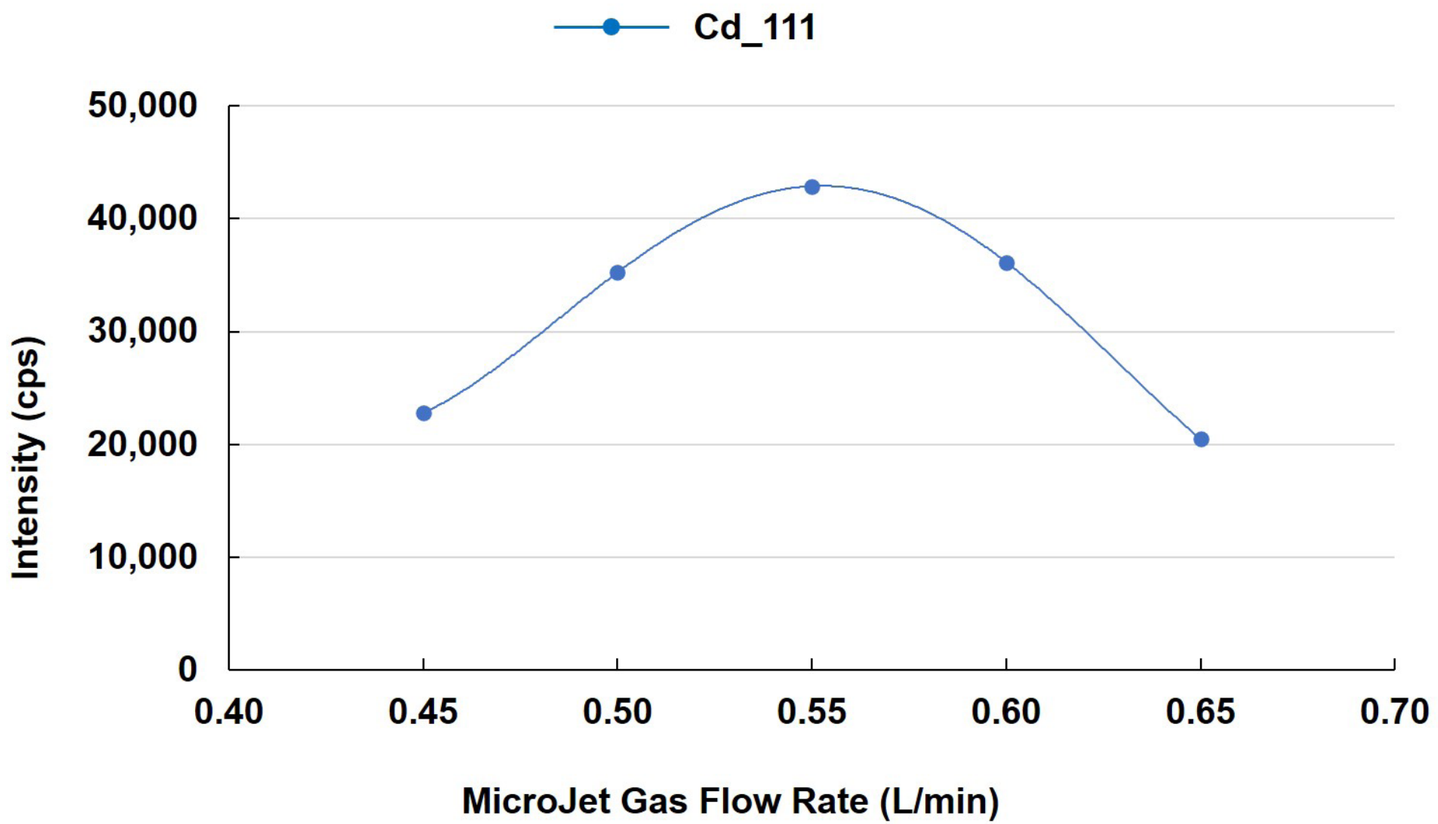
Optimization of MicroJet Gas Flow Rate - Mid Mass



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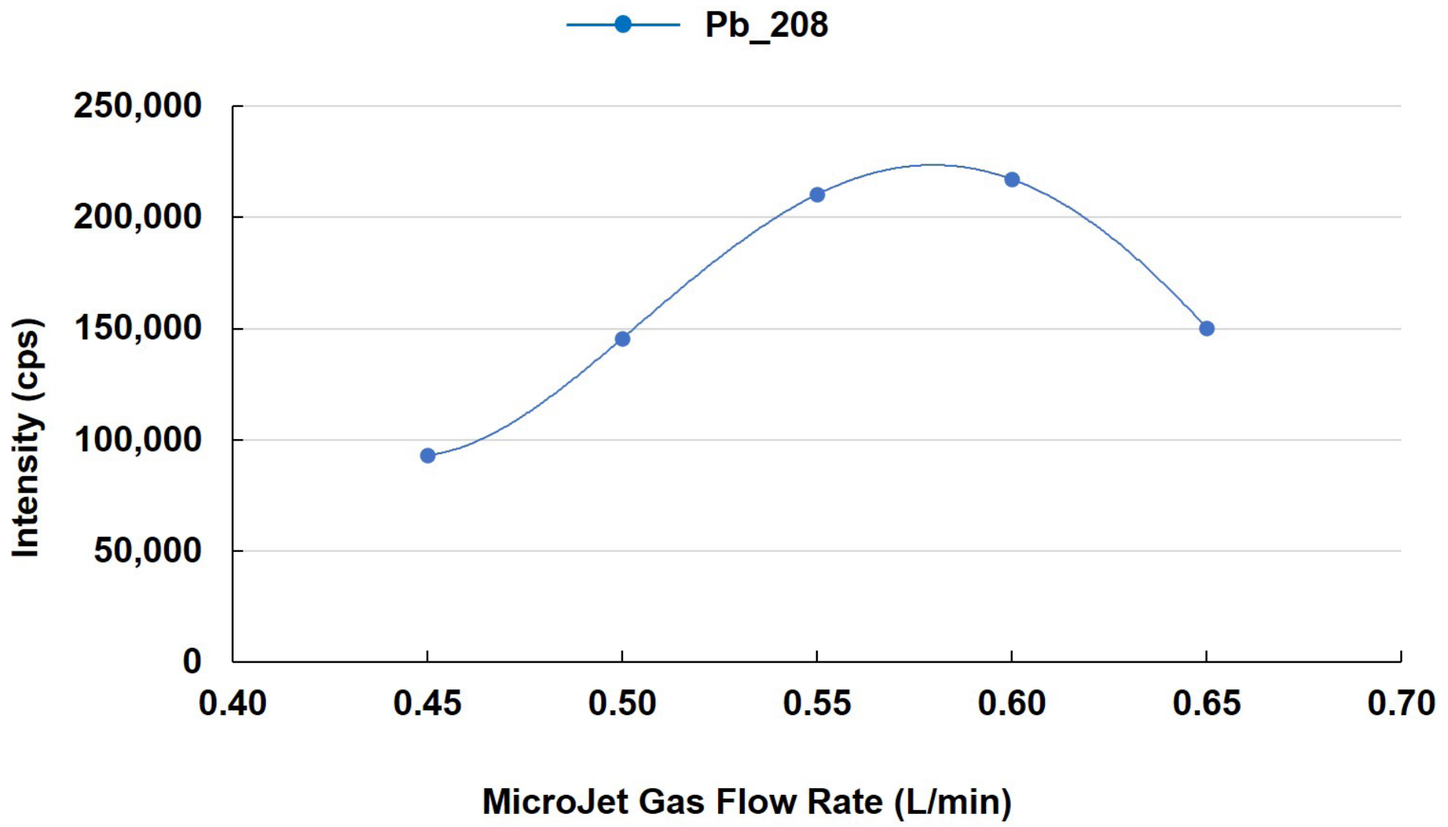
Optimization of MicroJet Gas Flow Rate - High Mass



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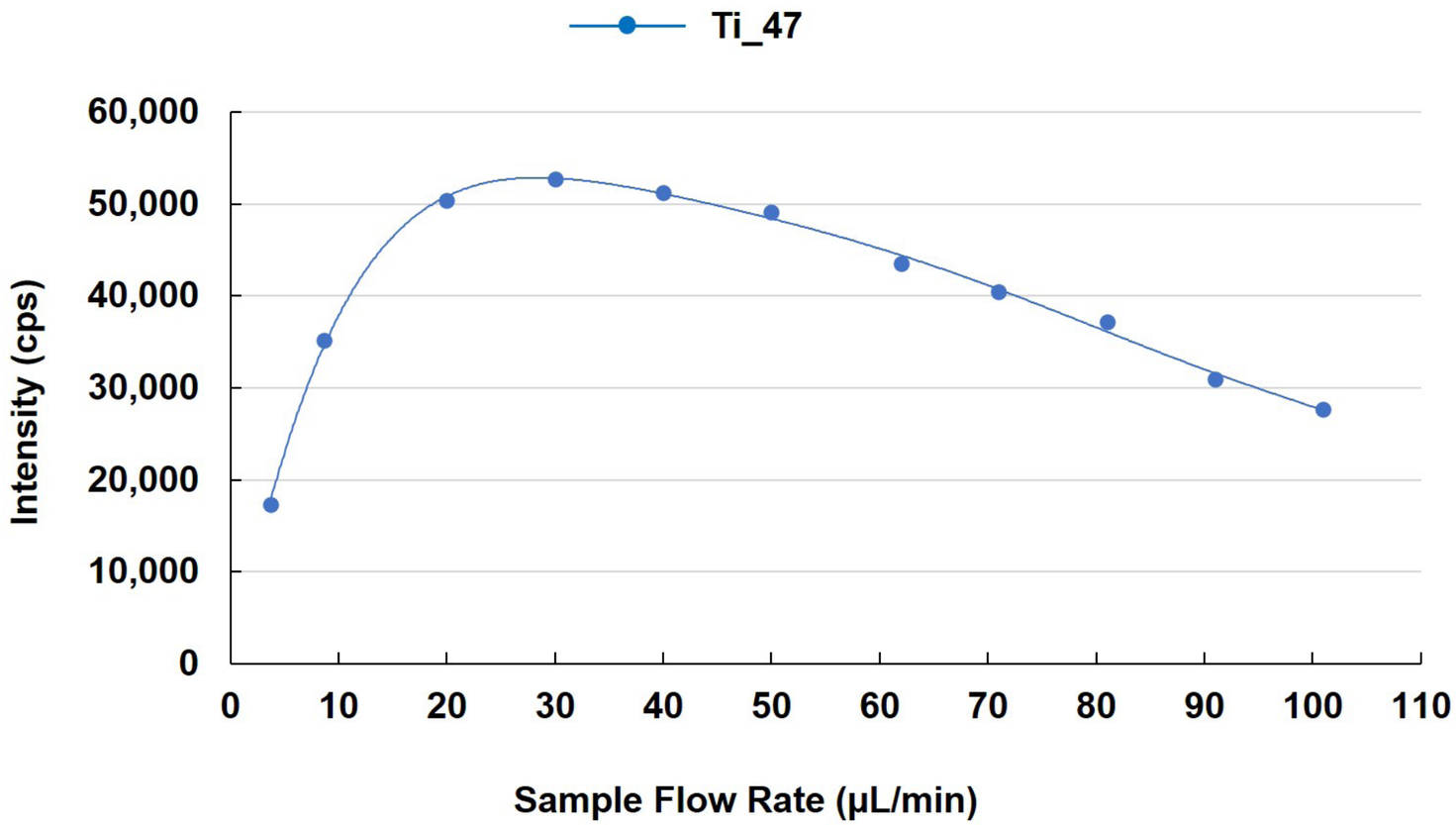
Optimization of Nebulizer Sample Flow Rate - Low Mass



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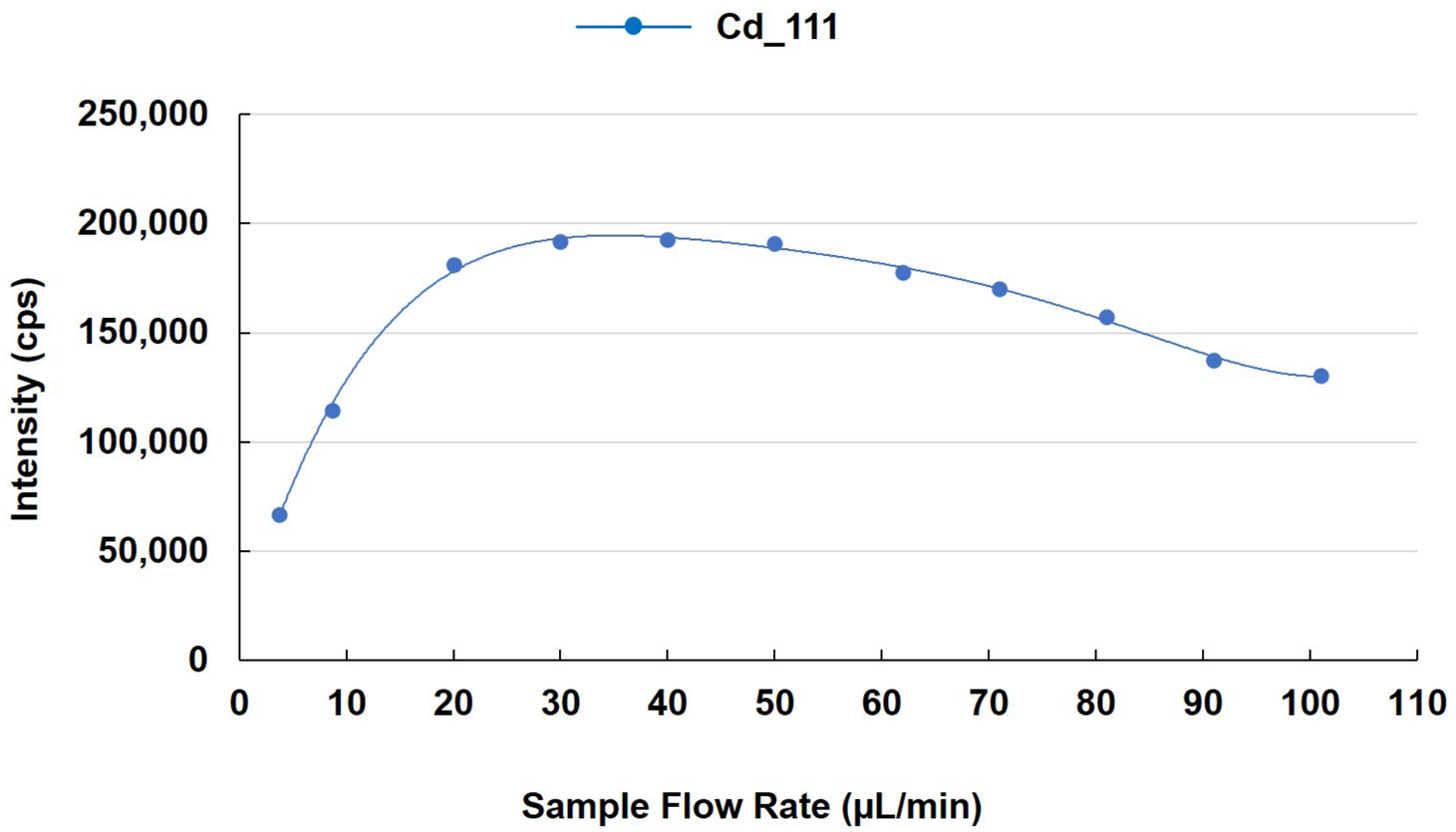
Optimization of Nebulizer Sample Flow Rate - Mid Mass



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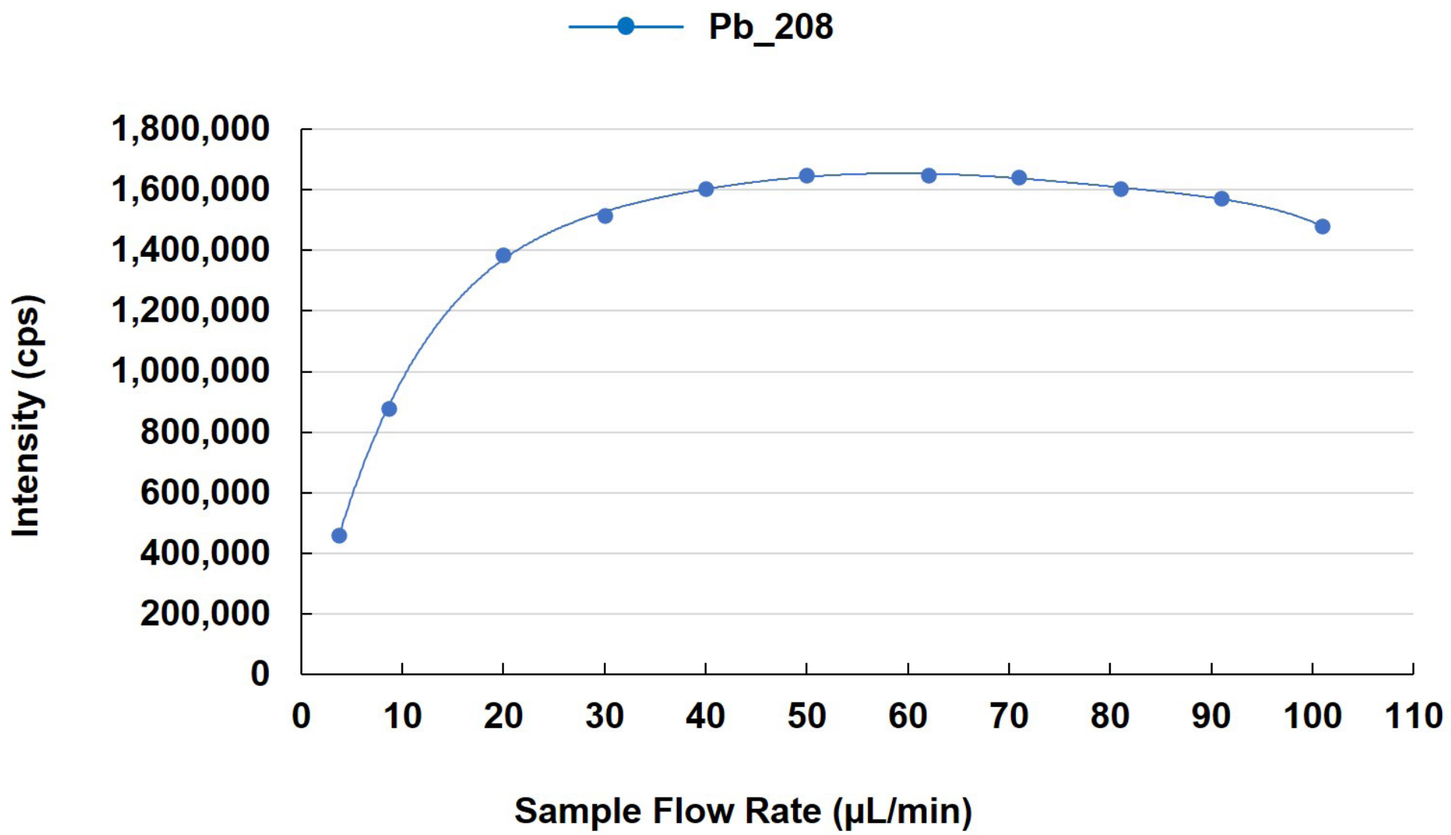
Optimization of Nebulizer Sample Flow Rate - High Mass



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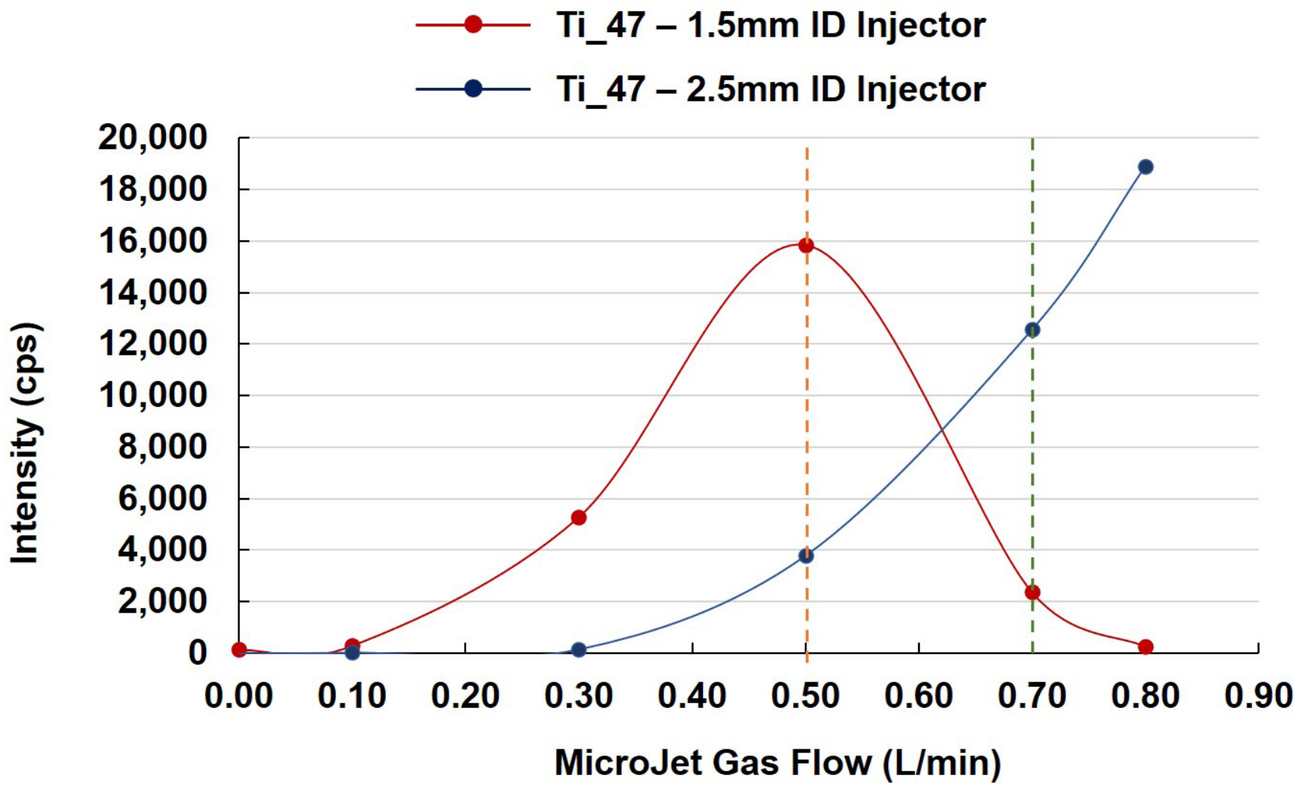
Optimization of Injector ID - Low Mass



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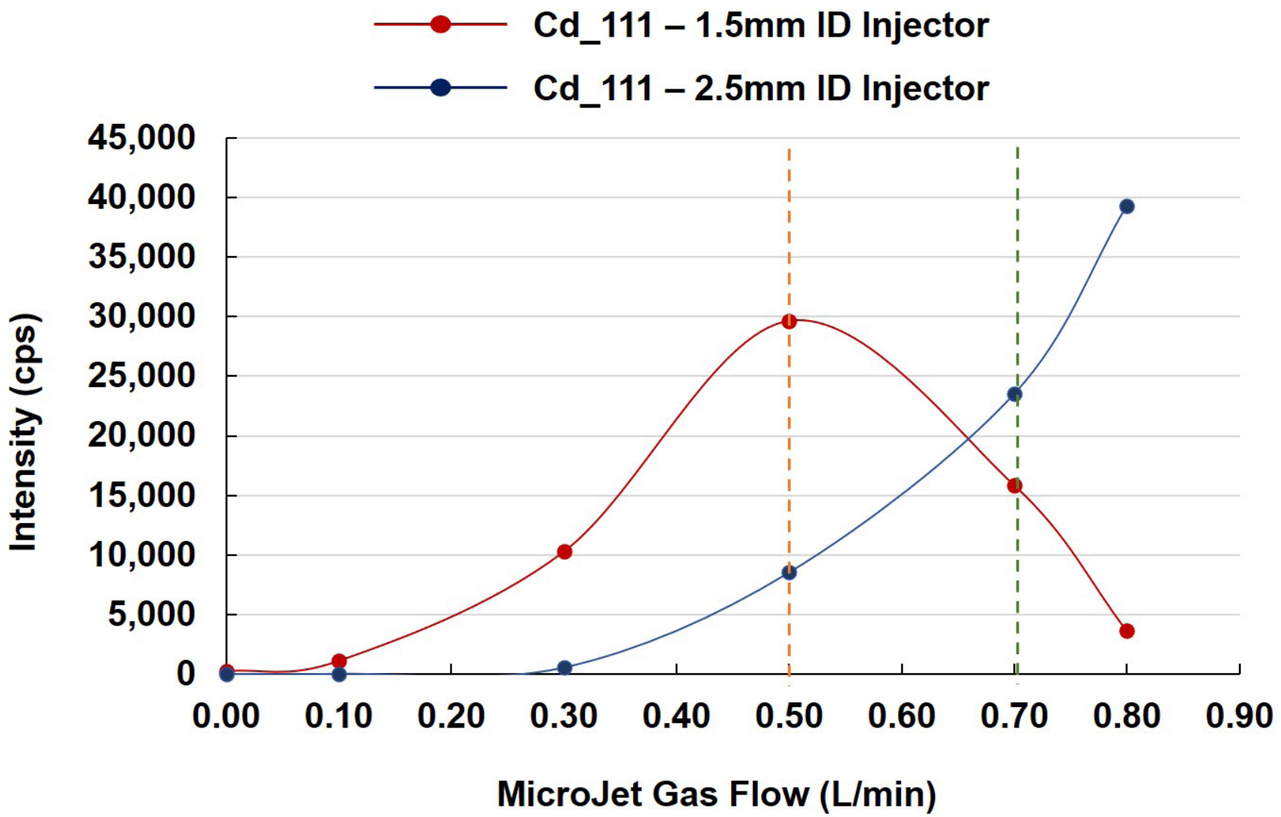
Optimization of Injector ID - Mid Mass



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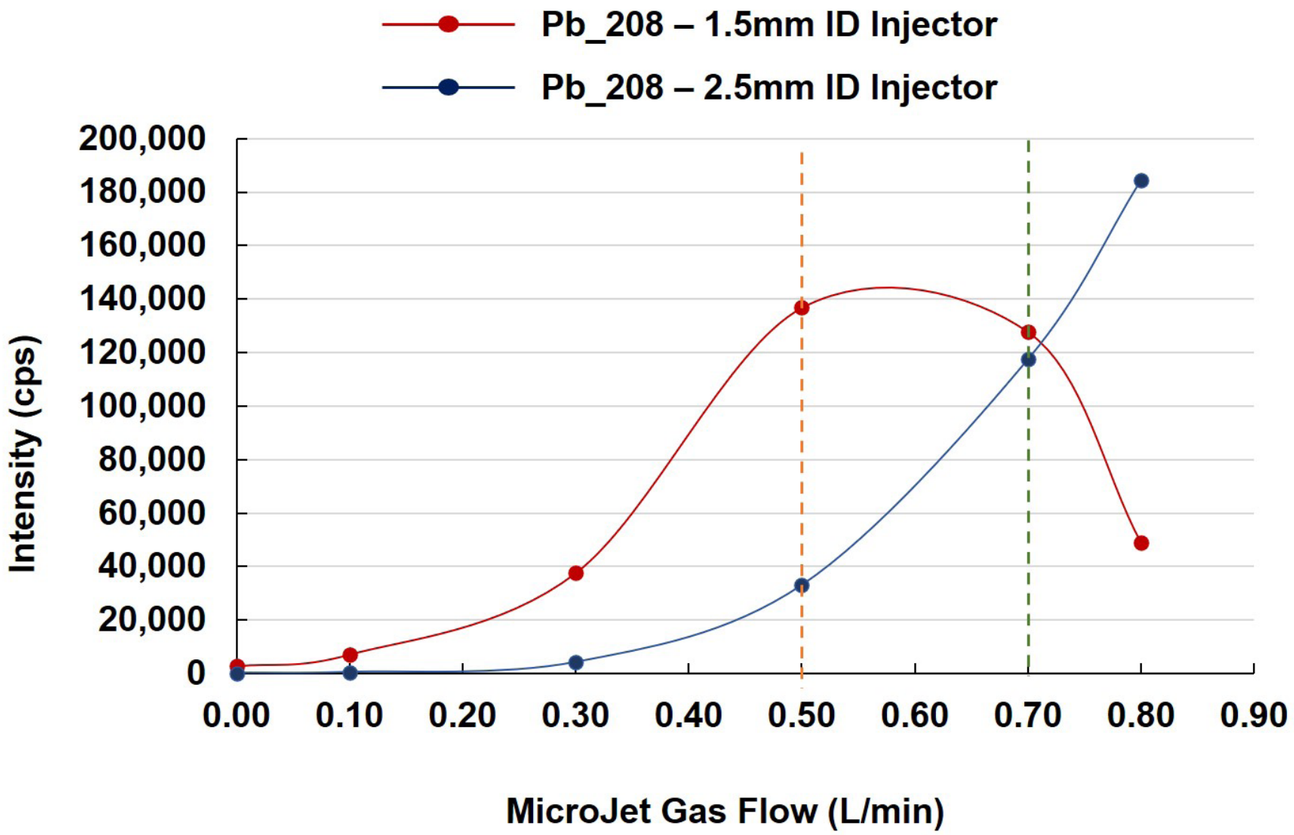
Optimization of Injector ID - High Mass



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Injector ID Summary

- At 0.35 L/min neb flow and 0.7 L/min make up flow, the 2.5mm ID injector had similar sensitivity to the 1.5 mm ID injector.
- The 1.5 mm ID injector was more sensitive at 0.35 L/min neb and 0.5L/min make up flow than the 2.5 mm ID injector.

Conclusion

- Optimum nebulizer flows were 0.35 L/min.
- MicroJet make up gas flow optimum about 0.55 L/min.
- A torch with an injector diameter of 1.5mm ID gave similar sensitivity to standard torch (2.5 mm ID injector), but 1.5 mm ID injector was more sensitive across a wider flow rate range.
- Optimum sample flow rate ranges (especially for low and mid masses) were found to be 20 uL /min to 40 uL /min.

Thank You

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