

Team D5				Bill of Materials						
Part #	Part Name	Qty	Unit Cost	Description	Functions	Material	TPD-SIMS D5			
							Dimensions	Base Cost	Link to Cost Estimate	
Sample Holder	1	Copper Clamps	2	\$285.00	Rectangular clamps with holes drilled in various places	Holds Sample in place	Copper	25mmx12mm	\$570.00	<a href="http://www.acmanufacturing.com/">http://www.acmanufacturing.com/</a>
	2	Sample	1	-	Rectangle material sent by Sandia	Used for experimentation	Stainless Steel	25mmx50mm	-	Sandia National Lab
	4	Wedge	1	\$835.00	Thin, circular plate base with two angled legs	Gives sample holder a flat surface with in circular chamber	Stainless Steel	75mm (R-35mm) x 2.5mm	\$835.00	<a href="http://www.acmanufacturing.com/">http://www.acmanufacturing.com/</a>
	5a	Ball Bearings Size A	3	\$0.06	Small, solid sphere	Align sample holder to wedge and allow for height variation of sample holder	316 Stainless Steel	D-3/32in	\$8.12	<a href="https://www.mcmaster.com/#96418k69/=1bjjic">https://www.mcmaster.com/#96418k69/=1bjjic</a>
	5b	Ball Bearings Size B	3	\$0.07	Small, solid sphere	Align sample holder to wedge and allow for height variation of sample holder	316 Stainless Steel	D-1/8in	\$8.00	<a href="https://www.mcmaster.com/#96418k71/=1bjjd0k">https://www.mcmaster.com/#96418k71/=1bjjd0k</a>
	5c	Ball Bearings Size C	3	\$0.08	Small, solid sphere	Align sample holder to wedge and allow for height variation of sample holder	316 Stainless Steel	D-5/32in	\$9.36	<a href="https://www.mcmaster.com/#96418k72/=1bjjd1">https://www.mcmaster.com/#96418k72/=1bjjd1</a>
	6	Clamp/Sample Screw	2	\$0.09	Small hex head screw	Allow clamp to hold sample tightly	316 Stainless Steel	M5x0.8mm, L=16mm	\$10.11	<a href="https://www.mcmaster.com/#93635a164/=1bghxf">https://www.mcmaster.com/#93635a164/=1bghxf</a>
	7	Clamp/Power Wire Screw	2	\$0.29	Small set screw	Hold wires against copper clamp	316 Stainless Steel	M2.5 x 0.45 mm, L=5 mm	\$8.53	<a href="https://www.mcmaster.com/#92929a097/=1bjid9">https://www.mcmaster.com/#92929a097/=1bjid9</a>
	8	Tightening eyebolt	2	\$1.11	A bolt with a ring shaped head	Align sample holder to the wedge	316 Stainless Steel	6-32x3/4"	\$1.37	<a href="https://www.mcmaster.com/#94895111/=1bjit3u">https://www.mcmaster.com/#94895111/=1bjit3u</a>
	9	Spring	2	\$0.67	Small compression spring	Hold down the tightening eyebolt	Stainless Steel	D-5.3mm	\$13.65	<a href="https://www.mcmaster.com/#91953a027/=1c40b2">https://www.mcmaster.com/#91953a027/=1c40b2</a>
	10	Alignment Bolt	2	\$0.40	Small hex head screw	Align sample holder to the wedge	316 Stainless Steel	M5x0.8, L=18mm	\$6.93	<a href="https://www.mcmaster.com/#93635a166/=1bk38y7">https://www.mcmaster.com/#93635a166/=1bk38y7</a>
	11	Nut	2	\$0.06	Chamber assembly nuts	Tighten spring onto bolt	316 Stainless Steel	M5x0.8mm	\$4.12	<a href="https://www.mcmaster.com/#94150a340/=1bghy9t">https://www.mcmaster.com/#94150a340/=1bghy9t</a>
	12	Washer	2	\$0.08	A small steel disk	Used so that the spring doesn't slip around the bolt	316 Stainless Steel	#10, 0.5" OD	\$8.05	<a href="https://www.mcmaster.com/#91953a027/=1c40b2">https://www.mcmaster.com/#91953a027/=1c40b2</a>
13	Ceramic Substitute	1	\$144.36	A small thin plate of ceramic Macor	Acts as the Alumina Base until it arrives	Macor	4" x 4" Sheet, 5/16"	\$144.36	<a href="https://www.mcmaster.com/#8489k245/=1c042j5">https://www.mcmaster.com/#8489k245/=1c042j5</a>	
Other Devices	14	Flood Gun	1	\$9,000.00	Shoot ions	Ionizes particles on sample	-	146mm incertion depth	\$9,000.00	<a href="http://www.omnivac.de/components/electron-sources/flood-source/index.html">http://www.omnivac.de/components/electron-sources/flood-source/index.html</a>
	15	Thermocouple and Power Feedthrough	1	\$443.00	Two thermocouple wires and power wires with current supply	Measure the temperature and heat the sample	-	2.75"CF	\$443.00	<a href="http://www.lesker.com/newweb/feedthroughs/thermocouple_feedthroughs_typek_miniplugpower_singleend.cfm?pid=cf">http://www.lesker.com/newweb/feedthroughs/thermocouple_feedthroughs_typek_miniplugpower_singleend.cfm?pid=cf</a>
	16	Hex Bolt Set	25	\$0.64	Regular Hex Head bolts	Used to connect the flange to the chamber	Stainless Steel	M8x1.38	\$16.00	<a href="https://www.lesker.com/newweb/flanges/hardware_cf_boltkit_s.cfm?pid=6p28highlight=HBKM8X35">https://www.lesker.com/newweb/flanges/hardware_cf_boltkit_s.cfm?pid=6p28highlight=HBKM8X35</a>
	17	Zero Length adaptor	1	\$97.00	Bolt on CF flanged adapter for vacuum chambers	Allows for Thermocouple to attach to Chamber	Stainless Steel	4-1/2" OD 2-3/4" 1.5 Bore 1.6" thick	\$97.00	<a href="https://www.lesker.com/newweb/flanges/flanges_cf_reducer.cfm?pid=std">https://www.lesker.com/newweb/flanges/flanges_cf_reducer.cfm?pid=std</a>
	18	Copper Gaskets	2	\$2.00	Thin circular rings	Used to connect the flange to the chamber and keep the vacuum seal	Copper	2.75" OD	\$20.00	<a href="https://www.duniway.com/part/q-0275">https://www.duniway.com/part/q-0275</a>
	19	Elbow Flange	1	\$275.00	Large thick steel elbow bend	Used to connect the Gate valve to the chamber	Stainless Steel	4.5" OD	\$275.00	<a href="https://www.duniway.com/part/q-0450">https://www.duniway.com/part/q-0450</a>
	20	Thermocouple Wires	2	\$3.50	K-Type thermocouple wire	Connects the thermocouple/Power feedthrough to the sample to measure temperature of sample	Chromel+/Alumel-	0.05"	\$3.50	<a href="http://www.lesker.com/newweb/feedthroughs/wire_thermocouple.cfm?pid=0">http://www.lesker.com/newweb/feedthroughs/wire_thermocouple.cfm?pid=0</a>
	21	Power Copper Wires	2	\$1.76	Thin, long Copper wire	Conduct current from power supply to heat sample	Copper	24", 0.26" Diameter	\$35.29	<a href="https://www.amazon.com/Artistic-Wire-24-Gauge-Copper-10-Yards/dp/B003WU1GQ0">https://www.amazon.com/Artistic-Wire-24-Gauge-Copper-10-Yards/dp/B003WU1GQ0</a>
	22	Ceramic Beads	20	\$4.46	Small ceramic beads	Keeps the thermocouple wires from touching metal	Alumina	.26" ID, .5" OD	\$89.20	<a href="https://www.lesker.com/newweb/feedthroughs/ceramic_fish_plineheads.cfm?pid=0&amp;highlight=FTACERB053">https://www.lesker.com/newweb/feedthroughs/ceramic_fish_plineheads.cfm?pid=0&amp;highlight=FTACERB053</a>
	23	Be/Cu Inline Barrel Connectors	10	\$13.40	Small, hollow cylinder with two screws	Will connect the power wires to feed through wires	Beryllium/Copper	ID - 0.26", OD - 0.5", L - 1"	\$134.00	<a href="http://www.lesker.com/newweb/feedthroughs/connectors_inl_barrel.cfm?pid=0">http://www.lesker.com/newweb/feedthroughs/connectors_inl_barrel.cfm?pid=0</a>
Miscellaneous	24	Power Supply for Heating Sample	2	\$2,150.00	Box with heat capability and wire connectors	Power supply used for Thermocouple to operate	-	482mmx133mm	\$4,300.00	<a href="http://www.lesker.com/newweb/process_instruments/dc_power_supply_kik_series.cfm">http://www.lesker.com/newweb/process_instruments/dc_power_supply_kik_series.cfm</a>
	25	Vacuum Epoxy	1	\$52.00	UHV safe adhesive	Stabilize Sample holder to Chamber	-	7.8g BIPAX	\$52.00	<a href="http://www.lesker.com/newweb/fluids/sealants_epoxy.cfm?pid=kl320k">http://www.lesker.com/newweb/fluids/sealants_epoxy.cfm?pid=kl320k</a>
	26	Gate Valve	1	\$1,590.00	Vacuum compatible gate valve for turbo pump	Shield turbo pump from ion gas	Stainless Steel	ISO63-F	\$1,590.00	<a href="http://www.lesker.com/newweb/meml_valves.cfm?section=gates&amp;unit=skip">http://www.lesker.com/newweb/meml_valves.cfm?section=gates&amp;unit=skip</a>
	27	Software	1	\$800.00	UHV compatible software	Analyze TOF Data	-	-	\$800.00	-
	28	Computer w/ DSP board	1	\$2,100.00	Software compatible board	Run Analytical Software	-	-	\$2,100.00	-
	29	Acetylacetone	1	\$40.50	Organic Compound	3 Parts used in sheel wedge coating	-	-	\$40.50	<a href="https://www.sigmaaldrich.com/catalog/substance/acetylacetone1001212354611?lang=en&amp;region=US">https://www.sigmaaldrich.com/catalog/substance/acetylacetone1001212354611?lang=en&amp;region=US</a>
	30	Aluminum Isopropoxide	1	\$169.00	Chemical Compound	3 Parts used in sheel wedge coating	-	-	\$169.00	<a href="https://www.sigmaaldrich.com/catalog/substance/aluminumisopropoxide2042455531711?lang=en&amp;region=US">https://www.sigmaaldrich.com/catalog/substance/aluminumisopropoxide2042455531711?lang=en&amp;region=US</a>
	31	Anhydrous Ethanol	1	\$59.00	Chemical Compound	2 Parts used in sheel wedge coating	-	-	\$59.00	<a href="https://www.sigmaaldrich.com/catalog/product/sial/459836?lang=en&amp;region=US">https://www.sigmaaldrich.com/catalog/product/sial/459836?lang=en&amp;region=US</a>
	32	Gravity Feed Spray Gun	1	\$21.00	Purple Gravity feed spray gun	Applies chemical compound coating	Aluminum	-	\$21.00	<a href="https://www.amazon.com/Central-Pneumatic-4701F-Pressure-Gravity/dp/B004SQS68U/ref=sr_1_fkmr0_1?ie=UTF8&amp;qid=1521258597&amp;sr=8-1-fkmr0&amp;keywords=Central+Pneumatic+4701F+High+Vol.+Low+Pressure+Gravity+Feed+Spray+Gun%2C+20+oz">https://www.amazon.com/Central-Pneumatic-4701F-Pressure-Gravity/dp/B004SQS68U/ref=sr_1_fkmr0_1?ie=UTF8&amp;qid=1521258597&amp;sr=8-1-fkmr0&amp;keywords=Central+Pneumatic+4701F+High+Vol.+Low+Pressure+Gravity+Feed+Spray+Gun%2C+20+oz</a>
<b>Total Cost Estimate:</b>								\$20,582.59		