

Final Report of

Department of Energy

Award Number DE-SC0005070

To

Eastern Michigan University

September 30, 2010 – September 30, 2013

“Building Surface Science Capacity to Serve the Automobile Industry in Southeastern Michigan”

Project Director: Weiden Shen

Final Report of
“Building Surface Science Capacity to Serve the Automobile Industry in Southeastern Michigan”
Funded by Department of Energy

Energy and Water Development and Related Agencies Appropriations Act of the Department of Energy (DoE) granted Eastern Michigan University (EMU) \$486,000 to support the project entitled, “Building Surface Science Capacity to Serve the Automobile Industry in Southeastern Michigan” in 2010.

The project includes two phases: (1) Renovating space in the new Science Complex, a self-funded project of EMU in 2009 of expanding the old Mark Jefferson Science Building, to include the Surface Science Laboratory (SSL), a very vigorous research lab at EMU that carries on a variety of research projects to serve the auto and other industries in Michigan; and (2) Purchasing equipment to further enhance the research capability of the SSL with a budget of \$282,375; see item 10 in the attached Appendix A1, DoE Budget.

The construction of the Science Complex and the renovation of rooms in the basement for the SSL were accomplished in October 2012, and a Progress Report was submitted to the DoE on November 6, 2012. The SSL was moved to the new labs in the Science Complex, and all the moved equipment was reset, tested, adjusted, and calibrated. The new labs were rearranged and ready for the new equipment by the end of 2012. We began to carry on the second phase of the project, purchasing, in 2013.

We planned to purchase the Multi-Function Electrochemical Impedance Spectroscopy System of Gamry and Confocal Raman Imaging Microscope System alpha300R of WITec. In our submitted proposal, the total cost, based on the quotes that we obtained from Gamry and WITec in 2010, was \$286,881.95 (\$44,353 + \$242,528.95), which exceeded the allocated budget of \$282,375 by a little bit. We anticipated reducing the cost through negotiating with the one or two companies to fit our budget, as stated on page 3-4 in the Budget Explanation of the proposal; see attached Appendix A2. Due to that, the total construction part cost \$218,755; the balance that remained in the budget for the equipment purchase was only \$267,245, which is less than the budgeted \$282,375 by \$15,130, i.e., 5.4%. It made our task of purchase even harder.

(i) Purchase of Confocal Raman Imaging Microscope System alpha300R of WITec: We began to renegotiate the purchase of alpha300R with WITec in early 2013. The price of the system has increased from \$242,528.95 to \$270,127 in the past three years. After several conversations over the phone, their Sales Manager and Application Scientist visited my lab. I openly told them this is the project funded by the DoE, the status of our strained budget, and our seriousness about purchasing their system. The results obtained by using their system in a variety of projects sponsored by industry companies will be shared with the companies, presented at the conferences, and published in the journals, which will advertise their products and give them

more opportunities for sales of their systems. They reported the discussion to their leaders; after waiting for a while, they finally gave us a friendly big discount of \$40,127, i.e., about 15% discount, to let us have the equipment for \$230,000 at the end of January, 2013; see the attached final quote, A3.

The EMU purchase order was sent out in early April, 2013; the delay was due to the concern of the EMU administration about the safety of the laser used in the system, which, in fact, is only 50 mW, and concern about the consistency of electricity, since the system is made in Germany, which, in fact, simply uses 110 V.

After receiving the order, WITec built the system and shipped it to my lab in June 2013. Their technicians assembled the system and conducted a three-day training session from June 17 – 19 in my lab. Please see the picture of Confocal Raman Imaging Microscope System alpha300R in my new lab in A4.

(ii) After securing the purchase of Confocal Raman Imaging Microscope System, we negotiated with Gamry immediately. Gamry, however, has completely renovated and upgraded their products. The Multi-function Electrochemical Impedance Spectroscopy System (MEISS) quoted in 2010 in our submitted proposal is no longer available and has been replaced by a new version, which is more functional and costs more. We adjusted our purchasing, reducing the interface units from the previous eight to three; the new version, Interface 1000, is more powerful than the old interface and can meet our needs for corrosion testing stated in our proposal, and adding one of their new advanced units, Reference 3000, which can be used in battery research.

Currently, the lithium batteries are widely used in electric vehicles. The high cost of the lithium battery remains a significant barrier to adoption. The electrochemical and thermodynamic properties of magnesium make it a natural choice for use as an anode material in rechargeable batteries. Rechargeable magnesium batteries are environmentally friendly, safe to handle, and extremely low in cost, about 1/20 of the lithium batteries. They might be an interesting future alternative to lithium batteries. To develop magnesium batteries, a lot of problems have to be addressed and solved, and a lot of research has to be carried out. We would like to explore it and are seeking funding to do so.

In addition, we eliminated a computer with operating software loaded and a monitor in the purchase list from Gamry, reducing \$3,340 in the cost. We purchased a computer with monitor from Dell, paying \$870 and taking advantage of EMU's long-time deal with Dell, and loaded the software by ourselves; see Appendix A6.

The total cost, even so, was still high. We negotiated with Gamry (EMU is a loyal customer of Gamry; our Coatings Research Institute made a couple of purchases from Gamry in the past years). They gave us a quantity discount of \$3,460.90 and an academic discount of \$6,250.50, which totals to \$9,726.40, i.e., close to a 22% discount, and let us have the System for \$35,123.60; see their final quote, A5. The System was delivered to my lab in May; see the

picture of Multi-function Electrochemical Impedance Spectroscopy System (MEISS) in the lab, A7.

(iii) Purchasing of lab tables for the two new instruments: We used the money remaining in the budget to have OnePointe Solutions customize two tables for the new instruments, which exactly fit the spaces in the lab for the Confocal Raman Imaging Microscope System alpha300R of WITec and Multi-function Electrochemical Impedance Spectroscopy System of Gamry, respectively. We paid \$1,801 for the two tables and the deficiency of \$549.60 was paid by my research account in the Department; see the appendix A8.

Please see the table, A9, which summarizes our purchase. We treasured the funding granted by the DoE and spent it with great carefulness to make it serve our project efficiently.

After the new equipment was set up, it was used immediately in research projects. My students Matthew Koehler and Lauren Thelen, after attending the training session, use the Confocal Raman Imaging Microscope System alpha300R to study the distribution of nano silicon particles in polymer coatings; see picture A10. To improve the mechanical and tribological properties of polymer coatings that are applied on auto bodies, nano particles are, recently, added to the coatings. Our study will better understand how the particles are distributed in the coating. Are most of the added particles on the surface or at the bottom? Does the density of the particles vary with depth? Combining with property characterization, it will help the coatings industry optimize the technique of using nano particles in improving the properties of coatings. My post-doctor Sen Song uses Multi-Function Electrochemical Impedance Spectroscopy System (MEISS) to do the corrosion test of magnesium alloys; see A11. Magnesium alloys are used more and more in industry due to its excellent mechanical property and its very light weight. GM, Ford, and Chrysler want to use it to replace steel and aluminum alloy in the front frame of autos to reduce the weight, thus saving gasoline, and improve the front and rear balance, thus making the autos even safer. One obstacle in using magnesium alloy is corrosion due to its vigorous chemical activity. Our study is testing the corrosion resistance of magnesium alloys after different surface treatments and applying different premium coatings (E-coatings, powder coatings, or other coatings), thus optimizing the combination of surface treatment and premium coating to enhance the corrosion resistance of magnesium alloys.

The funding granted by the DoE was proposed to “renovate the space in the Science Complex to include SSL and purchase equipment for tribological and electrochemical impedance measurements in the lab, thus SSL will serve the auto and other industries in Michigan better.” We believe we have fully accomplished the mission.

BUDGET INFORMATION - Construction Programs

NOTE: Certain Federal assistance programs require additional computations to arrive at the Federal share of project costs eligible for participation. If such is the case, you will be notified.

COST CLASSIFICATION	a. Total Cost	b. Costs Not Allowable for Participation	c. Total Allowable Costs (Columns a-b)
1. Administrative and legal expenses	\$.00	\$.00	\$.00
2. Land, structures, rights-of-way, appraisals, etc.	\$.00	\$.00	\$.00
3. Relocation expenses and payments	\$.00	\$.00	\$.00
4. Architectural and engineering fees	\$.00	\$.00	\$.00
5. Other architectural and engineering fees	\$.00	\$.00	\$.00
6. Project inspection fees	\$.00	\$.00	\$.00
7. Site work	\$.00	\$.00	\$.00
8. Demolition and removal	\$.00	\$.00	\$.00
9. Construction	\$.00	\$.00	\$.00
10. Equipment	\$.00	\$.00	\$.00
11. Miscellaneous	\$.00	\$.00	\$.00
12. SUBTOTAL (sum of lines 1-11)	\$.00	\$.00	\$.00
13. Contingencies	\$.00	\$.00	\$.00
14. SUBTOTAL	\$.00	\$.00	\$.00
15. Project (program) income	\$.00	\$.00	\$.00
16. TOTAL PROJECT COSTS (subtract #15 from #14)	\$.00	\$.00	\$.00
FEDERAL FUNDING			
17. Federal assistance requested, calculate as follows: (Consult Federal agency for Federal percentage share.) Enter the resulting Federal share.	Enter eligible costs from line 16c Multiply X _____%		\$.00

**BUDGET EXPLANATION PAGE FOR
NON-RESEARCH FINANCIAL ASSISTANCE (CONSTRUCTION)**

Please provide detailed information in narrative form to support those categories that pertain to your project's budget items.

1. Administrative Expenses/Legal Expenses (Item 1 on Budget Information Page)

- a. Identify any domestic or foreign travel costs (estimate number of trips, destinations, and purposes of travel). Include an itemization of costs including airline, hotels, rental cars, etc. Specify the basis for the expenses (e.g., airline ticket quotations, past trips of a similar nature, etc.). Identify any legal expenses associated with the project and provide the basis for the cost.

No such expenses are anticipated.

- b. Identify any work pertaining to the locating and designing, surveying and mapping, and other related work required prior to actual construction. Provide the basis for the expenses (e.g., previous work of a similar nature, contractor quote, etc.)

No such expenses are anticipated.

- c. Identify any personnel positions that will be supported under this grant. Provide a justification for the need for the personnel that will be covered under this grant. State the amounts of time (i.e., hours or percentages of time) to be expended by each position under this grant. Identify the basis for the proposed compensation.

No such expenses are anticipated.

2. Land/Structure/Rights-of-Way (Item 2 on Budget Information Page)

- a. Describe any costs associated with site and right-of-way acquisition (including purchasing, leasing and/or easements).

No such expenses are anticipated.

3. Relocation Expenses (Item 3 on Budget Information Page)

- a. Describe any costs related to relocation expenses.

We request a very modest amount of funding \$500 for the possibility of the cost of moving laboratory materials and equipment from the existing facility to the new space – from one building to the newly renovated space in the building next door.

4. Architectural/Engineering Fees (Items 4 & 5 on Budget Information Page)

- a. Describe the professional services to be provided. Itemize the costs and provide the basis for the costs (e.g., contractor quote or estimate, negotiated fee, etc.).

This project is an off-shoot of a much larger renovation project of the entire building, and for practicality's sake we will use the firms engaged in that larger project. Those firms were selected by a competitive bid process. Records are available upon request.

We received a quote of \$15,000 for fees to develop layout / design plans for the new laboratory, from LAS, the architect for main project,.

- b. Provide a brief justification of how the contractor was selected (e.g., selection by bid process, newspaper advertisement, etc.).

This project is an off-shoot of a much larger renovation project of the entire building, and for practicality's sake we will use the firms engaged in that larger project. Those firms were selected by a competitive bid process. Records are available upon request.

- c. Are any sole source contracts contemplated? Provide sufficient detail for justification of the use of a single source contract.

This project is an off-shoot of a much larger renovation project of the entire building, and for practicality's sake we will use the firms engaged in that larger project. Those firms were selected by a competitive bid process. Records are available upon request.

5. Project Inspection Fees (Item 6 on Budget Information Page)

- a. Describe the costs associated with any fees for inspection and audit of the construction activities associated with the project.

Any such fees will be covered by the larger overall building renovation project.

6. Site Work/Demolition and Removal (Items 7 & 8 on Budget Information Page)

- a. Describe the costs associated with the site preparation, demolition and removal of structures/objects from the area under development. If this activity is to be contracted out, please describe the process used for selecting the contractor (e.g., RFP, contractor/vendor quotations, etc.).

Any such costs will be covered by the larger overall building renovation project.

7. Construction (Item 9 on Budget Information Page)

- a. Describe the work and itemize the costs associated with the actual construction of, addition to, or renovation of a facility.

We estimate a cost of \$250/square foot for fitting out the new laboratory space, including lab benches and modernizing utilities for the room. This is the average cost calculated for the renovation of the rest of the basement as part of the larger project.

- b. If the construction activity is to be contracted out, please describe the process used for selecting the contractor (e.g., RFP, other selection process, etc.).

This project is an off-shoot of a much larger renovation project of the entire building, and for practicality's sake we will use the firms engaged in that larger project. Those firms were selected by a competitive bid process. Records are available upon request.

- c. Are any sole source contracts contemplated? Provide sufficient detail for justification of the use of a single source contract.

This project is an off-shoot of a much larger renovation project of the entire building, and for practicality's sake we will use the firms engaged in that larger project. Those firms were selected by a competitive bid process. Records are available upon request.

8. Equipment (Item 10 on Budget Information Page)

- a. Itemize and describe the equipment (both fixed and movable) that are to be purchased under this grant (include permanently attached laboratory tables, built-in audiovisual systems, movable desks, chairs and laboratory equipment, and medical equipment such as linear accelerators, CT scanners, etc.).

(1) Multi-function Electrochemical Impedance Spectroscopy System: Product of Gamry; it is a movable research set-up, and is not permanently attached to laboratory tables; it can operate in DC mode, AC mode and AC/DC/AC mode, controls eight testing cells simultaneously, and evaluate corrosion resistance of metallic samples after the surface treatment and coated with polymeric coating.

(2) Confocal Raman Imaging Microscope System alpha300R: Product of WITec; It is a movable research instrument, and is not permanently attached to laboratory tables; it has two-fold functions, acquiring three-dimensional high-resolution confocal fluorescence image of sample surface under examination and acquiring complete Raman spectra pixel by pixel when scanning over a selected area.

- b. Provide the basis for the cost estimates (e.g., vendor quotations, catalog pricing charts, etc.)

(1) Multi-function Electrochemical Impedance Spectroscopy System of Gamry: \$44,353; see the attached quote

(2) Confocal Raman Imaging Microscope System alpha300R of WITec: \$242,528.95; see the attached quote

We anticipate negotiating one or both of these prices downward so that they fit within the constraints of our budget (\$282,375 for equipment).

- c. Briefly justify the need for the items to be purchased.

The Surface Science Laboratory (SSL) participates a project of USCAR (United States Council for Automotive Research), which is an organization of Chrysler, Ford and GM, supported by DOE. The project investigates using magnesium alloys to replace steel and aluminum alloys in the front end frame to reduce the weight of vehicles, thus saving gasoline, and improve the front and rear balance, thus enhancing the safety. Magnesium alloys are very vulnerable to corrosion. The task for SSL is evaluating corrosion resistance of the alloys after different surface treatments and depositing different coatings for optimizing the treatment and coating. The Multi-function Electrochemical Impedance Spectroscopy System will be used for the testing.

The Surface Science Laboratory (SSL) works on a variety of micro/nano mechanics and micro/nano tribology projects on coatings and materials surfaces. Our existing scanning probe microscope (SPM) is used to examine the surface morphologies and take topographic images of the surfaces with extremely high resolution. However, knowing the chemical variation on the surfaces is very important, too. Purchasing the Confocal Raman Imaging Microscope will greatly enhance our capability of carrying out various surface related research projects, thus serving industrial companies better.

9. Other/Miscellaneous (Item 11 on Budget Information Page)

- a. Provide a description of any other cost items that are not included in one of the previous sections.

No such expenses are anticipated.

- b. Itemize the costs and provide the basis for the cost of the items in part 9a.

No such expenses are anticipated.

- c. Briefly justify the need for the items under this section.

No such expenses are anticipated.

10. Contingencies (Item 13 on Budget Information Page)

- a. Please provide your estimated contingency costs and provide a basis for your estimate.

We have estimated contingency costs of 7.5% of the construction costs, or \$13,125.



Eastern Michigan University
Prof. Weidian Shen
Department of Physics and Astronomy
Ypsilanti MI 48197
UNITED STATES

WITec Instruments Corp.
130G Market Place Blvd.
Knoxville, TN 37922
USA

fon +1 865 984 4445
fax +1 865 984 4441

www.witec-instruments.com

Quotation No. 101259

date 27-Jan-2013
contact Tavis Ezell
fon 865 984 4445
tavis.ezell@witec-instruments.com

Thank you again for your interest in our products. It is a pleasure to offer the following items:

Item	Part Number	Quantity	Unit Price	Extended Price
1	XCK3000-1702	1 piece	230,986.00	\$230,986.00
WITec Confocal Raman Imaging Microscope System alpha300 R, with highest sensitivity for 532 nm excitation wavelength, High Throughput Configuration with following specifications: modes of operation: • Raman Spectral Imaging: acquisition of complete Raman spectra at every pixel (mapping) • acquisition of Raman spectra at selected areas (micro-Raman) • 3D confocal Raman imaging • confocal microscopy in reflection • confocal fluorescence imaging • optical resolution: diffraction limited lateral typ. 250 nm @ 532 nm excitation wavelength (with objective NA 1.4) • sample size: max. 120 mm in x- and y-direction, 25 mm in height (for samples with larger height an adapter can be used) • wavelength range VIS, others optional, typ. detection from < 95 - ca. 4000 wavenumbers @ 532 nm excitation wavelength The alpha300 R System includes:				
Subtotal:				\$230,986.00

Item	Part Number	Quantity	Unit Price	Extended Price
1.1	XCK3001-0211	1 piece		
	WITec Confocal Raman Microscope alpha300 R base including • Optical microscope with 6x turret • Piezo-driven scan platform for sample scanning, continuous scan range up to 200um in x- and y-direction, 20um in z-direction, scan hardware linearized with closed-loop feedback, scan resolution: position accuracy < 4 nm in x- and y-direction and < 0.5nm in z- direction, linearity better than 0.03%, achieved through capacitively controlled hardware linearization • video system: eyepiece color video camera • Motorized z-stage system for automated approach, 30mm travel, single step 10 nm resolution • Manual sample positioning in x- and y-direction, 20mm travel, gradation 10um, resolution < 1um • LED white-light source for Köhler illumination			
1.2	XMZ3000-1000	1 piece		
	alphaControl Digital Controller for WITec Microscope systems System on a programmable chip controller with the following features: • 80MHz FPGA • 64MB SDRAM • 4 MB SRAM • High speed USB 2.0 connection (480 MBit/s) • Three 32bit counters with integrated APD/PMT overload protection • Three digital outputs for user applications • Digital input for user applications • Three RS232 serial ports for extensions and user applications • Two free FPGA slots for future extensions • XYZ scan stage with closed loop controlled piezos and capacitive sensors (optional) • Motorized Microscope z-axis control • White light LED Köhler illumination • Three free slots for further extensions			

Item	Part Number	Quantity	Unit Price	Extended Price
1.3	XME3050-2000	1 piece		
	Computer System for control and data acquisition of the alpha300 series microscopes • 4 x 2,8 GHz Quad core, 4GB RAM, 1000GB HD, DVD RW or better • keyboard and mouse • Computer interface to controller • Frame grabber for video cameras • Interface to spectrograph and CCD Camera (if required)			
1.4	XME3051-0190	2 pieces		
	Monitor 19" LCD for Computer System or better			
1.5	XM3022-0532	1 piece		
	Raman laser coupler 532nm for WITec microscopes , with standard FC single-mode fiber connector optical input, filter slider assembly with dichroic beam splitter, raman edge filter and band pass filter, extendable for polarization measurements.			
1.6	XSF3000-0021	1 set		
	Set of 3 Multimode Fibers with FC/APC connector, length 3m with 25, 50 and 100 micrometer core diameter			
1.7	XMC3100-2061	1 piece		
	UHTS 300 spectrometer VIS , f/4 300mm focal length imaging spectrometer with standard FC/APC optical fiber entrance and dual grating turret incl 2 gratings with 1800 and 600 lines/mm @ 500nm			
1.8	XMC3022-1001	1 piece		
	Camera for spectroscopy thermoelectrically cooled with backilluminated CCD chip optimized for VIS Peltier cooling down to -65 °C, Marconi 40-11CCD chip with 1024 x 127 pixel format, VIS AR coating, camera controller with 16bit A/D converter 100kHz, USB 2.0 interface, attached to spectrograph/monochromator			
1.9	MSX3100-4000	1 piece		
	WITec Control Software for the alphaControl SPM controller • Scan control • Feedback • Data acquisition • Counters			

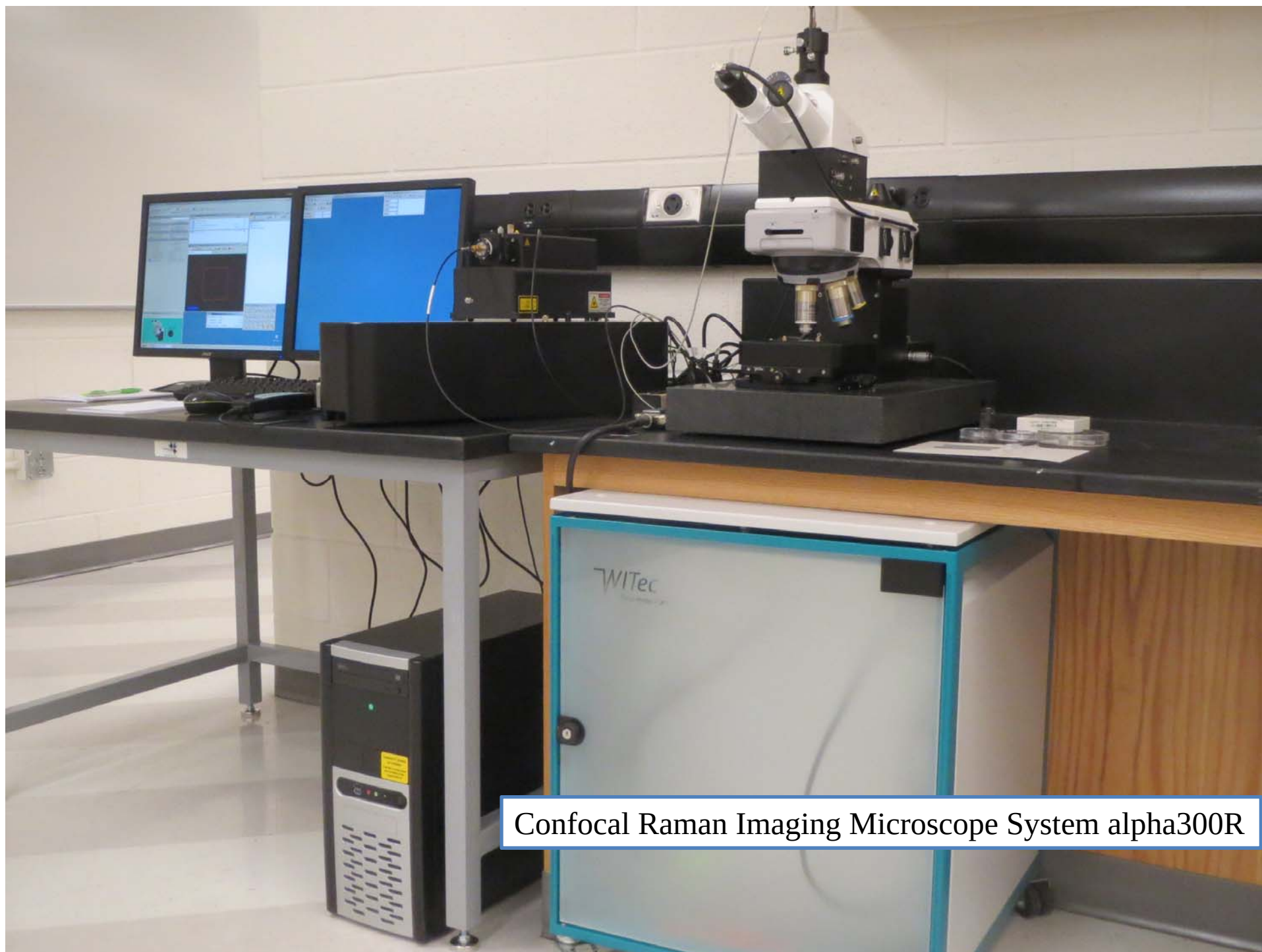
Item	Part Number	Quantity	Unit Price	Extended Price
	• Visualization and online data processing (line-by-line averaging, background subtraction ...), data post-processing • Project manager to collect from and connect multiple sources of data and evaluations • Data acquisition from video cameras			
1.10	MSX3000-7000	1 piece		
	WITec Project Software for data evaluation (multiple installations possible) Software Capabilities: • Visualization and offline data processing (line-by-line averaging, background subtraction ...) • Project management to collect and connect multiple measurements and evaluations			
1.11	XCK3001-0001	1 piece		
	Set of Tools for the alpha300/500/700 R Confocal Raman Microscope			
1.12	XCB3000-1000	1 piece		
	Scientific Literature - Confocal Raman Microscopy (Springer Series in Optical Sciences 158, ISBN 978-3-642-12521-8). Editors: Dr. Thomas Dieing, Dr. Olaf Hollricher and Dr. Jan Toporski (WITec GmbH)			
2	XSL3100-1133	1 piece	26,460.00	\$26,460.00
	Frequency doubled Nd:YAG laser, 532 nm, 50 mW power at laser output (typically 45mW at fiber end), single longitudinal mode, intra cavity frequency doubling, including optical isolator and fiber coupling unit, 3 m PM fiber with angled FC connector. Fits directly to laser coupler of the WITec microscope systems laser class 3B.			
3	XSO3025-0100	1 piece	875.00	\$875.00
	Objective 10x , Zeiss EC "Epiplan" DIC, numerical aperture (NA) 0.2, working distance (WD) 16,1 mm, including adapter ring for WITec microscope systems			
4	XSO3025-0500	1 piece	1,575.00	\$1,575.00
	Objective 50x , Zeiss EC "Epiplan" DIC, numerical aperture (NA) 0.7, working distance (WD) 1.1 mm, including adapter ring for WITec microscope systems			
			Subtotal:	\$259,896.00

Item	Part Number	Quantity	Unit Price	Extended Price
5	XSO3026-1000	1 piece	3,731.00	\$3,731.00
	Objective Zeiss EC "Epiplan-Neofluar" 100x NA=0.9; WD=0.31 mm, for applications from 360nm to NIR with excellent flatness of field, including adapter ring for WITec microscope systems			
6	XCK3001-0010			\$6,500.00
	Installation and Training for alpha300/500/700 microscope series. Includes one credit voucher towards WITec Academy Advanced Instruments & Software Operation Training at WITec facility. The credit must be used within 12 months of installation.			
7		1	270,127.00	\$270,127.00
	System Price:			
8		1	(40,127.00)	(\$40,127.00)
	Special Collaboration Discount with Dr. Weidian Shen:			

			Total:	\$230,000.00
Delivery time: 18 weeks after receipt of purchase order Delivery terms: EXW Ex Works, estimated shipping of \$2,500 Payment terms: 30 days net Warranties: 12 months workmanship, limited to replacement, repair or an appropriate refund. For specified lasers warranty is limited to operating hours. Quotation valid until: 15-Feb-2013 ** Alternative item, not included in Net Sum and Total. Please include the document number on all payments and communication. Until payment in full, the supplier reserves ownership of the goods. Original terms and conditions apply.				

Yours sincerely,

WITec Instruments Corp., Tavis Ezell



Confocal Raman Imaging Microscope System alpha300R



Select Components

1. COMPONENTS

2. REVIEW SUMMARY



OPTIPLEX 7010 MINITOWER

Price

\$870.00

Preliminary Ship Date: 3/20/2013

Print Summary

SYSTEM OPTIONS

Processors

The 3rd generation Intel® Core™ processor family brings visibly smart performance to your business PCs by helping increase system responsiveness, enhance multi-tasking and graphics performance. Intel Core i7 and Core i5 are Quad Core processors that support enhanced VT-x, VT-d virtualization functionality.

3rd Gen Intel® Core™ i5-3570 (Quad Core, 3.40GHz, 6MB w/HD2500 Graphics)

Help Me Choose

☒ 3rd Gen Intel® Core™ i5-3570 (Quad Core, 3.40GHz, 6MB w/HD2500 Graphics) [Included in Price]

Operating System(s)

A system with a 64-bit operating system (Windows® 7) can handle larger amounts of information than a 32-bit system. Since it can use more RAM—4 GB and up—a 64-bit computer can be more responsive when you're running lots of programs at once. Your system does not come with an operating system recovery disk. For an additional cost, you may select a recovery media disk if desired.

Windows 7 Home Premium, No Media, 64-bit, English

Help Me Choose

☒ Windows 7 Home Premium, No Media, 64-bit, English [Included in Price]

OptiPlex 7010 MT

The base selection below will require a matching power supply unit (PSU) in a separate PSU section. For example, a Standard PSU Base will require a Standard PSU and an Up to 90% Efficient Base will require an Up to 90% Efficient PSU.

OptiPlex 7010 Minitower w/ Standard Power Supply

Help Me Choose

☒ OptiPlex 7010 Minitower w/ Standard Power Supply [Included in Price]

Memory

Memory will clock at the MHz speed as supported by the chipset and processor. Dual channel memory requires memory modules to be installed in pairs of matched sizes, speed, and technology.

4GB, NON-ECC, 1600MHZ DDR3,2DIMM

Help Me Choose

☒ 4GB, NON-ECC, 1600MHZ DDR3,2DIMM [Included in Price]

Removable Media Storage Device

Your system does not come with a recovery media disk for your optical software. For an additional cost, you may select a recovery media disk if desired. Optical Device options described as "No Media" do not include a recovery media disk. Click here to purchase a recovery media disk!

16X DVD+/-RW and 16X DVD,SATA

Help Me Choose

☒ 16X DVD+/-RW and 16X DVD,SATA [Included in Price]

May delay your OPTIPLEX 7010 MINITOWER ship date

Productivity Software

Microsoft Office 2013 gives you powerful new tools to express your ideas, solve problems and connect with people. Microsoft Office does not come with a recovery disk. Recovery media is available in the System Recovery Options tab. Click here to learn more.

No Productivity Software

☒ No Productivity Software [Included in Price]

Graphics Cards

The AMD Radeon HD 7470 and HD 7570 offer a DVI and a DisplayPort connector. Choosing a graphics card option which includes adapters adds support for VGA OR Dual DVI connectors.

1GB AMD RADEON HD 7470,FH,w/VGA

Help Me Choose

☒ 1GB AMD RADEON HD 7470,FH,w/VGA [Included in Price]

Monitors

Dell OptiPlex 7010 includes a VGA and two DisplayPort connectors natively on the Minitower, Desktop and Small Form Factor chassis. For

increased productivity, we recommend choosing a dual monitor solution and upgrading your graphics card to an AMD RADEON HD Solution.

DELL 22IN E2213 FP,BLK,OptiPlex, Precision and Latitude

- ☐ DELL 22IN E2213 FP,BLK,OptiPlex, Precision and Latitude [Included in Price]
[May delay your OPTIPLEX 7010 MINITOWER ship date](#)

**Boot Hard Drives**

The OptiPlex 7010 offers a wide range of hard drives from 3.5" standard desktop drives to 2.5" models as well as Self Encrypting Drive (SED) and Solid State Drive technologies. 2.5" drives enable the use of multiple drives in one chassis, while SED drives deliver added data security. Solid State drives deliver increased reliability and performance. Please click here for more information about 512e drives: www.dell.com/512e-drives

250GB 3.5" SATA 6Gb/s with 8MB DataBurst Cache™

[Help Me Choose](#)

- ☐ 250GB 3.5" SATA 6Gb/s with 8MB DataBurst Cache™ [Included in Price]

Systems Management Mode

Hardware system management mode options enable you to take advantage of the latest generation of hardware-based systems management technology. When coupled with the appropriate systems management software, these hardware-enabled features allow you to proactively manage systems in your install base regardless of operating system condition or power state of the PC's.

No Out-of-Band Systems Management

[Help Me Choose](#)

- ☐ No Out-of-Band Systems Management [Included in Price]

**Energy Efficiency Options**

From the start, Dell considers the full product lifecycle. Minimize your energy costs and environmental impact with both ENERGY STAR® 5.2 qualified and EPEAT registered (see epeat.net for specific registration levels and country participation) configurations.

No ESTAR Settings

[Help Me Choose](#)

- ☐ No ESTAR Settings [Included in Price]

**Keyboard**

Your PC comes with a Dell USB keyboard: Upgrade to a keyboard to meet your needs.

Dell KB212-B USB 104 Quiet Key Keyboard,English

[Help Me Choose](#)

- ☐ Dell KB212-B USB 104 Quiet Key Keyboard,English [Included in Price]

**Mouse**

Your PC comes with a Dell USB Mouse unless otherwise selected.

Dell MS111 USB Optical Mouse

[Help Me Choose](#)

- ☐ Dell MS111 USB Optical Mouse [Included in Price]

Setup and Features Information Tech Sheet**More than one selected**

- ☐ No Tech Sheet [Included in Price]
☒ Tech Sheet, English [Included in Price]

Thermal**Heat Sink, Performance, Minitower**

- ☐ Heat Sink, Performance, Minitower [Included in Price]

Speakers**Dell AX510PA Sound Bar for all Entry Flat Panel Displays (Black)**

- ☐ None [subtract \$25.52]
☒ Dell AX510PA Sound Bar for all Entry Flat Panel Displays (Black) [Included in Price]

Power Supply**OptiPlex 7010 MT Standard PSU**

- ☒ OptiPlex 7010 MT Standard PSU [Included in Price]

Documentation**OptiPlex 7010 Documentation English**

- ☐ OptiPlex 7010 Documentation English [Included in Price]

Resource DVD**No Resource DVD**

- ☐ No Resource DVD [Included in Price]

Shipping Packaging Options

Shipping Material for System, Minitower

☐ Shipping Material for System, Minitower [Included in Price]

SERVICE OPTIONS

Hardware Support Services

3 Year Basic Hardware Service with 3 Year NBD Limited Onsite Service After Remote Diagnosis

[? Help Me Choose](#)☐ 3 Year Basic Hardware Service with 3 Year NBD Limited Onsite Service After Remote Diagnosis [Included in Price][Review Summary](#)[Add To Cart](#) Preliminary Ship Date: **3/20/2013**

1. COMPONENTS

2. REVIEW SUMMARY

Please note that this Microsoft software product may use technological measures for copy protection. In such event, you will not be able to use the product if you do not comply with the product activation or reactivation procedures, which may be completed by Internet or telephone (toll charges may apply).

Configuration, pricing, and monthly payment information above is estimated and presented for your convenience only. All pricing, shipping and monthly payment information is subject to change without notice. Final order specifications and amounts, including tax and shipping, will be communicated following receipt of your online order. Dell will not be responsible for typographical or other errors or omissions regarding prices or other information. Products displayed are available to US customers who take delivery in the 50 United States. All sales are subject to Dell's Term and Conditions of Sale.

Intel, Pentium, Intel Inside and the Intel Inside logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

The Preliminary Ship Date represents the estimated time it takes to process your order and custom build your computer based on approved purchase. The Preliminary Ship Date is not intended to provide you with an actual estimated ship date. You will receive your estimated ship date in your e-mail confirmation after purchase. Your estimated ship date may vary based upon quantity of computers ordered.

OPTIPLEX 7010
MINITOWERPrice **\$870.00** Preliminary Ship Date: **3/20/2013**[Print Summary](#)[Review Summary](#)[Add To Cart](#)[? Help](#)

© 2013 Dell For customers of the 50 United States and the District of Columbia only.
[Site Terms](#) | [Terms of Sale](#) | [Privacy](#) | [Feedback](#)

[Large Text](#)

snFG02



Quotation

To: Wade Shen
Eastern Michigan University
Physics & Astronomy
313 Strong Hall
Ypsilanti, MI 48197

Delivery Est.: 45 Days ARO
Ship Via: FedEx Ground
FOB: Warminster, PA, USA
Exp. Date: 4/28/2013
RFQ #:

Phone (734)487-8797

Fax:

Email: wade.shen@emich.edu

ITEM	QTY.	PART NO.	DESCRIPTION	Unit Price	EXT. PRICE
1	1	992-00089	MultEchem Interface 1000 Test System Consisting of: • USB Software License Key • UDC4 Universal Dummy Cell	\$0.00 Acad.Disc:15.0%	\$0.00
2	3	990-00286	Interface 1000 Potentiostat/Galvanostat/ZRA Includes: • Two Year Warranty • Reference 600/ Interface 1000 Cell Cable, 0.6m • AC-DC Power Adapter • USB 2.0 Cable, Type A to B	\$6,515.00 Quant.Disc:10.0% Acad.Disc:15.0%	\$19,545.00
3	1	992-00076	MultEchem Reference 3000 System Consisting of: • USB Software License Key • UDC4 Universal Dummy Cell • Operator's Manual (On Digital Media)	\$0.00	\$0.00
4	1	990-00224	Reference 3000 Potentiostat/Galvanostat/ZRA Includes: • Two Year Warranty • Lead Free • Reference 3000 USB Cable, 2.0m • AC/DC Power Supply • 48" Banana to Banana Cable	\$13,120.00 Quant.Disc:10.0% Acad.Disc:15.0%	\$13,120.00
5	1	987-00048	Global Software License includes: DC105 DC Corrosion Software License CPT110 Critical Pitting Temperature Software License EN120 Electrochemical Noise Experiment Software License EFM140 Electrochemical Frequency Modulation Software License PHE200 Physical Electrochemistry Software License PV220 Pulse Voltammetry Software License EIS300 Electrochemical Impedance Software License ESA410 Electrochemical Signal Analyzer Software License VFP600 Virtual Front Panel Software License PWR800 Electrochemical Energy Software License (PWR800 cannot be used with Series G/ PCI4 potentiostats)	\$6,615.00 Acad.Disc:15.0%	\$6,615.00
6	1	992-00090	Interface Power Hub (120V) Includes: • Interface Power Hub • USB 2.0 cable, 6ft • Power Cord • 8 Interface Cable Kits • Two Year Warranty on Inetrface Power Hub	\$2,750.00	\$2,750.00



Quote: 2013-0349E

Date: 3/28/2013

Cust. ID: EASTMIUNI-MI

Quotation

To: Wade Shen
Eastern Michigan University
Physics & Astronomy
313 Strong Hall
Ypsilanti, MI 48197

Delivery Est.: 45 Days ARO
Ship Via: FedEx Ground
FOB: Warminster, PA, USA
Exp. Date: 4/28/2013
RFQ #:

Phone (734)487-8797

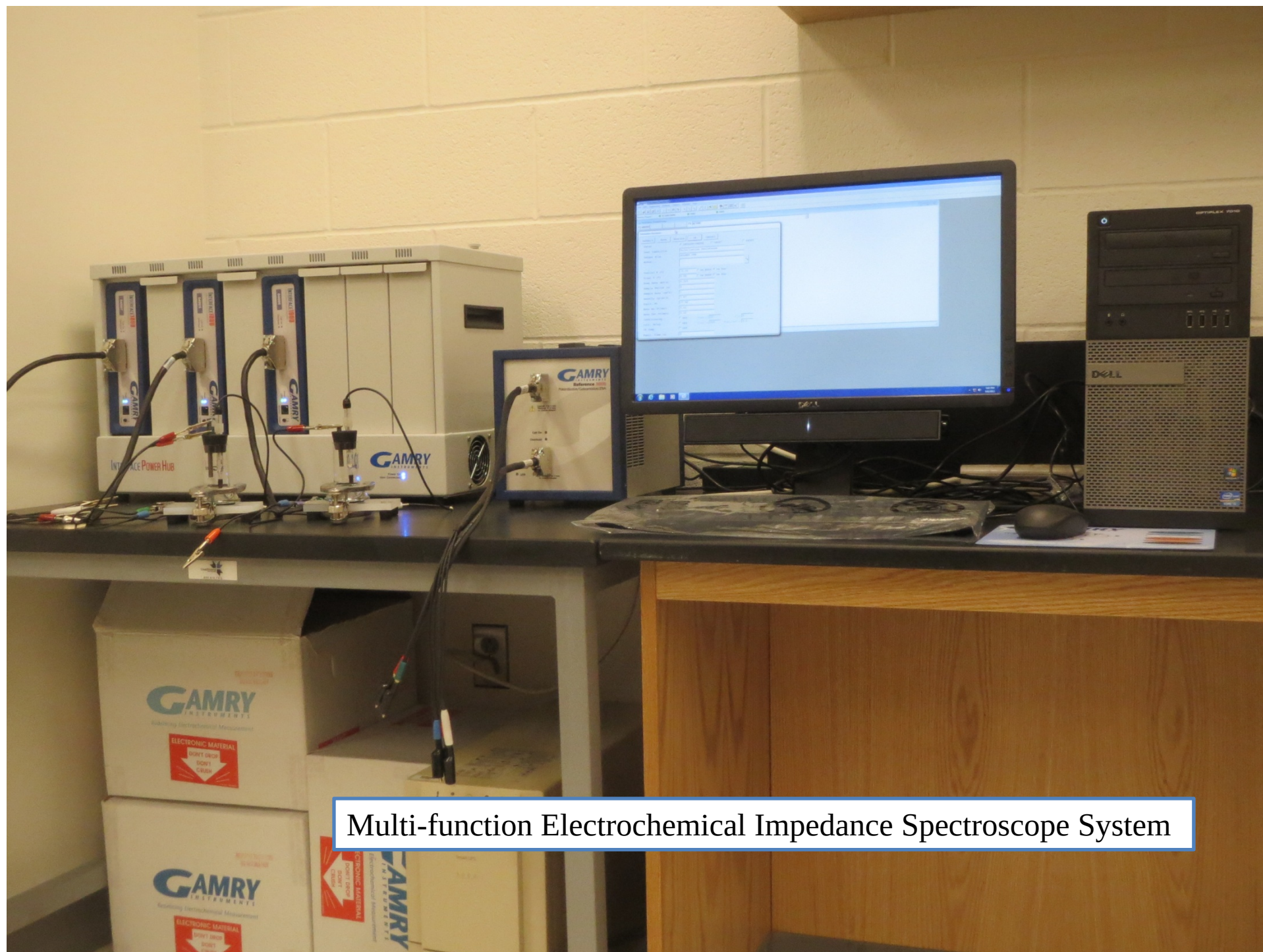
Fax:

Email: wade.shen@emich.edu

ITEM	QTY.	PART NO.	DESCRIPTION	Unit Price	EXT. PRICE
7	6	930-00003	Saturated Calomel Reference Electrode	\$280.00	\$1,680.00
				Quant.Disc:8.0%	Acad.Disc:15.0%
8	6	990-00197	PTC1-Paint Test Cell (w/o Reference Electrode)	\$125.00	\$750.00
Consists of:				Quant.Disc:8.0%	Acad.Disc:15.0%
• PTC1 Cell Body (with O-Ring)					
• Rubber Stopper					
• Graphite Rod - 8mm x 6"					
• Clamp					
• PortHoles(TM), Electrochemical Sample Masks: 1cm2, 3cm2, 10cm2					
(2 each)					
• PTC1 Instruction Sheet					
• Does Not Include a Reference Electrode					
9	1	955-00002	Saturated Potassium Chloride Filling Solution	\$60.00	\$60.00
				Acad.Disc:15.0%	
- Optional 5% Prepayment Discount Available. (Does not apply to Credit Card payments) - Payment Due Net 30 Days from Invoice Date. - Credit Approval Required. - A monthly 1.5% Rebilling Charge will be added to unpaid balances. - Academic Discounts apply only to Orders received from Degree Granting Institutions.				Total List	\$44,520.00
				Qty. Disc.	(\$3,460.90)
				Acad. Disc.	(\$6,265.50)
				Subtotal	\$34,793.60
				Shipping Charge	\$330.00
				Amount Due	\$35,123.60
				Send purchase orders to: Orders@gamry.com	

3/28/2013

Burak Ulgut, Ph.D., Market Development Specialist
bulgut@gamry.com



Multi-function Electrochemical Impedance Spectroscopy System



**Your No. 1 Source For Laboratory
and Industrial Furniture**

Quote Number: 00240696

Date of Quote: 04.01.13

Sales Rep: Gene Moreno

Phone: 866.612.7312 ext. 109

Fax PO to: 866.612.7327

Email PO to: gene_moreno@onepointesolutions.com

Address: 8606 Wall Street, Suite 100
Austin, Texas 78754

SHIP TO:

Wade
Eastern Michigan University
900 Oakwood St
Ypsilanti, MI 48197
734-487-8797
wshen@emich.edu

BILL TO:

Wade
Eastern Michigan University
900 Oakwood St
Ypsilanti, MI 48197
734-487-8797
wshen@emich.edu

QTY	Part Number	Description	Weight	Price	Extended Amount
1	LT-483030	Laboratory Table (FW) : Worksurface - 48L x30W x30H 1.25" Black Epoxy Resin 1/8" Beveled Edge Frame Construction - 46 x 28 x 27.75 Full Weld & Grind 1.5" x 1.5" Tubular Steel C-FRAME Frame Color : Medium Gray (7045) Welded 1/2-13 Inserts 2 Inch On X-Axis 2 Inch On Y-Axis	125.76 Lbs.	\$ 575.00	\$ 575.00
1	ASE-GLIDE	Nylon Leveling Feet (1/2" Thread)	Lbs.	\$ 6.00	\$ 6.00
1	LT-423030	Laboratory Table (FW) : Worksurface - 42L x30W x30H 1.25" Black Epoxy Resin 1/8" Beveled Edge Frame Construction - 40 x 28 x 27.75 Full Weld & Grind 1.5" x 1.5" Tubular Steel C-FRAME Frame Color : Medium Gray (7045) Welded 1/2-13 Inserts 2 Inch On X-Axis	113.78 Lbs.	\$ 534.00	\$ 534.00



**Your No. 1 Source For Laboratory
and Industrial Furniture**

		2 Inch On Y-Axis			
1	ASE-GLIDE	Nylon Leveling Feet (1/2" Thread)	Lbs.	\$ 6.00	\$ 6.00
2	PLT - 6842GP	Pallets & Wood Crates (Domestic & International)	Lbs.	\$ 75.00	\$ 150.00

Total Weight:	239.54 Lbs.
Estimated Shipping:	\$ 530.00
Sales Tax:	0.00

Total:	\$ 1,801.00
---------------	--------------------

WANT TO PAY NOW? CLICK THE LINK BELOW

Pay with a Credit Card via our Secure Payment Portal

Standard Delivery:

Your order will be delivered to the address on the quote; the freight company will only unload the pallets onto a loading dock. Once on the Dock it is the receiver's responsibility to notate freight damage, uncrate, install and dispose of packaging material. This quote does not include advance notification, liftgate, limited access, local storage, inside delivery, or white glove installation services. If you require any of these services please call your sales rep for an updated quote.

Special Note For Epoxy Resin Countertops:

Due to the very nature of resin, tolerances in thickness and minor warpage can develop. It is not uncommon to have a 1/8" warp in a 4 feet, or 1/16" difference in thickness. Careful installation when aligning sections is recommended, we emphasize the importance of installing all tops in numerical order. OnePointe assumes no responsibility for the removal of material that has been cemented in place

Budget/Spending of Grant from DoE

Fund: R70700	Org: 108400	Acct #: 5030	Prog: 30	
Balance	after Construction			
	267,245.00			
Date	Purchase	Cost	Status	Left in Budget
2013/06	Confocal Raman System	230,000.00	Received	37,245.00
2013/05	Gamry EIS	35,123.60	Received	2,121.40
2013/05	Computer for Gamry EIS	870.00	Received	1,251.40
2013/06	2 Lab Tables for the Instruments	1,801.00	Received	-549.60



Matthew Koehler and Lauren Thelen working with alpha300R



Sen Song working with MEISS