



SOLE SOURCE CERTIFICATE AND POSTING NOTICE

(Greater than \$150,000)

A sole source procurement is when you make a request to purchase product(s) and/or service(s) without competition when competition is otherwise required. This means that product/service is unique and that the supplier is the only supplier that can provide the product or service. In accordance with the authority granted under applicable Florida law and UCF Regulation 7.130, the following documentation is submitted in support of this request.

This form and related documentation shall be submitted through Workday Help using case type Waivers and Sole Source. Please do not attach to a requisition or send via email for review and approval.

WD case subject title should have common structure for easy tracking, to include:

- Exemption type (Sole Source)
- Supplier name
- Purchase amount

The completed sole source must be approved in the following order. **Please be sure to obtain all required signatures before submitting the form to Procurement Services.**

- PI/Researcher/Director/Chair
- President/Vice President/Dean
- Procurement Specialist
- Procurement Services Manager or Associate Director
- Assistant Vice President for Tax, Payables & Procurement, who will review and provide a recommendation to approve or disapprove the sole source to:
- Chief Financial Officer, who will either directly approve or disapprove the sole source, or forward it to the Provost and Executive Vice President for goods/services related to academia for input prior to making the final decision.

Once the completed sole source is received, Procurement Services in collaboration with kNEXT reviews the documentation provided and determines whether the sole source is valid or if there are additional suppliers that may be able to provide the requested product or service. The sole source review and approval process varies based on the nature of the product/service being requested and the information provided in the requestor's justification, among other factors, so please keep this in mind when submitting the form.

Contingent upon the approval of all the officers/individuals listed, the sole source shall be posted on the UCF Procurement Services website for seventy-two (72) hours. Upon expiration of said posting period, Procurement Services will process a purchase order upon receipt of the requisition.

The usual bidding process shall be conducted if sole source approval is not granted.

PART I: DEPARTMENT AND SUPPLIER INFORMATIONDepartment Name: PhysicsContact & Phone: 6505615247Product/Service Cost: 161,000 * \$161,400.00 per quote☒ One Time Purchase ☐ Term Contract: _____☐ Multiple Purchases ☐ Duration: _____Company Name: Graphene IndustriesEmail: peter@grapheneindustries.comContact Person: Peter BlakeTitle: Managing DirectorProduct and/or Service: 2D crystal manipulation system**PART II: SOLE SOURCE JUSTIFICATION (see pages 4-5)**

Only justifications submitted on this form and in the below format will be reviewed for approval. All the listed points MUST be fully answered on the following pages and any additional attached pages as needed. Failure to submit justification as outlined in the format below will result in the form being returned without review.

PART III: SOLE SOURCE CERTIFICATIONS

- A. In my professional opinion, this is the only product or service that can reasonably meet my requirement(s)/specification(s), and this is the only supplier who can provide the product or service. I further certify that the information contained herein is true and correct to the best of my knowledge and belief and would withstand any audit or supplier protest.
- B. I, the undersigned, certify that I and/or the user do not have a financial interest in the above named supplier or contractor, and that I am unaware of any conflict of interest related to this purchase.

Christian Heide
Digitally signed by Christian Heide
 Date: 2026.05.25 18:23:17 -04'00'

SignatureChristian Heide**Printed Name and Title (PI/Researcher/Director/Chair)**05/25/2026**Date**

Joshua Colwell
Digitally signed by Joshua Colwell
 Date: 2026.06.08 10:22:06 -04'00'

SignatureJoshua Colwell, Dean, College of Sciences**Printed Name and Title (President/Vice President/Dean)**06/08/2026**Date**

(Delegations not allowed; emails from absent approvers are acceptable)

I, the undersigned, hereby concur with the above justification and support a sole source approval for the above product(s) and/or service(s). Approvals may be documented and supported via email.

Stefanie DelGiudice
Digitally signed by Stefanie DelGiudice
 Date: 2026.06.26 12:06:16 -04'00'

SignatureStefanie Jollie DelGiudice, Procurement and Contracts Specialist**Printed Name and Title (Procurement Specialist)**06/26/2026**Date**via e-mail**Signature**Brian Sargent, Procurement Services Manager**Printed Name and Title
(Procurement Services Manager or Associate Director)**Thursday, July 9, 2026 11:16 AM**Date**via e-mail**Signature**Joel Levenson, Assistant Vice President for Tax, Payables & Procurement**Printed Name and Title
(Asst. Vice President for Tax, Payables & Procurement)**Thursday, July 9, 2026 12:10 PM**Date**

via e-mail

Albert Francis, Interim Vice President of Administration & Finance and Chief Financial Officer

Monday, July 20, 2026 7:16 PM

Signature

Printed Name and Title (Chief Financial Officer)

Date

POSTING NOTICE

07/23/2026 12:00 PM

Date/Time Posted

07/28/2026 12:00 PM

Posting End Date

2702

UCF Control No.

Stefanie DelGiudice

Procurement Specialist

Stefanie DelGiudice

From: Albert Francis
Sent: Monday, July 20, 2026 7:16 PM
To: Joel Levenson; Brian Sargent
Cc: Stefanie DelGiudice; Nellie Nido
Subject: Re: C0176258 Sole Source Graphene Industries \$161,400.00

Sorry for the delay, team. I agree with this decision as well!

Thanks,
Bert

Bert Francis, CPA

Interim Vice President / Chief Financial Officer / University Treasurer
Administration and Finance
University of Central Florida
4635 Andromeda Loop N
MH384
Orlando, FL 32816
Tel: (407) 882-1075
Email: Albert.Francis@UCF.Edu

From: Joel Levenson <Joel.Levenson@ucf.edu>
Sent: Monday, July 20, 2026 9:53 AM
To: Brian Sargent <Brian.Sargent@ucf.edu>; Albert Francis <Bert.Francis.III@ucf.edu>
Cc: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>; Nellie Nido <nellie.nido@ucf.edu>
Subject: RE: C0176258 Sole Source Graphene Industries \$161,400.00

Good morning,

I know Bert is returning from recent leave. Give him some time to catch up on his emails and I'm sure we'll be ok here.

From: Brian Sargent <Brian.Sargent@ucf.edu>
Sent: Monday, July 20, 2026 9:07 AM

To: Joel Levenson <Joel.Levenson@ucf.edu>; Albert Francis <Bert.Francis.III@ucf.edu>
Cc: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>; Nellie Nido <nellie.nido@ucf.edu>
Subject: RE: C0176258 Sole Source Graphene Industries \$161,400.00

Good afternoon,

TGIF! Just following up on this.

Regards,

Brian

From: Joel Levenson <Joel.Levenson@ucf.edu>
Sent: Thursday, July 9, 2026 12:10 PM
To: Albert Francis <Bert.Francis.III@ucf.edu>
Cc: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>; Nellie Nido <nellie.nido@ucf.edu>; Brian Sargent <Brian.Sargent@ucf.edu>
Subject: RE: C0176258 Sole Source Graphene Industries \$161,400.00

Good afternoon Bert,

I also approve of this sole source award. Research into this supplier shows that the product meets the needs of the department's research vs. other products available. Additionally, other agencies have awarded sole source awards for this product.

If you agree, please reply all to this email and indicate as such. If you have additional questions, let me know.

From: Brian Sargent <Brian.Sargent@ucf.edu>
Sent: Thursday, July 9, 2026 11:16 AM
To: Joel Levenson <Joel.Levenson@ucf.edu>
Cc: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>; Nellie Nido <nellie.nido@ucf.edu>
Subject: FW: C0176258 Sole Source Graphene Industries \$161,400.00
Importance: High

Hi Joel,

I support this sole source as to Graphene Industries for a microscope based instrument. Physics researched other potential products but they could not meet their mandatory requirements. Additionally, a search of GovSpend found an approved sole source issued by the Naval Research Laboratory .

Please approve/disapprove and let me know if you have any questions.

Regards,

Brian

From: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>

Sent: Friday, June 26, 2026 12:41 PM

To: Brian Sargent <Brian.Sargent@ucf.edu>

Subject: C0176258 Sole Source Graphene Industries \$161,400.00

Importance: High

Sole Source Approval Request

Supplier: Graphene Industries

Amount: \$161,400

I **recommend approval**. The request meets the criteria for a **non-competitive procurement**, as competition is not practicable and only one supplier can satisfy the requirement.

Basis for Determination

The sole source is justified based on:

- **No Practicable Competition:** Market research supports that no alternative supplier provides the full combination of required capabilities.
- **Unique Integrated Functionality:** Only Graphene Industries offers a system combining deterministic transfer, precision alignment, integrated heating, and optical/PL workflow compatibility in a single platform.
- **Non-Equivalent Alternatives:** Evaluated vendors (HQ Graphene, Signatone) do not meet mandatory technical and workflow requirements.
- **Established Research Continuity:** Substitution would require redevelopment, retraining, and revalidation, introducing material risk to performance and timelines.
- **Exclusive Source:** No distributors or resellers identified; procurement is direct from the manufacturer.

External Validation

Public-sector precedents further support this determination:

- The **U.S. Naval Research Laboratory** issued a federal sole source award to Graphene Industries for a comparable system.
- **International research procurements** have similarly issued exemptions citing the system's unique technical integration.

These precedents reinforce that other agencies have validated both **supplier exclusivity** and **lack of functional competition**.

Price Reasonableness

The total cost of **\$161,400** is determined **fair and reasonable** based on the specialized nature of the system, inclusion of integrated components, installation, training, and warranty, and absence of comparable alternatives.

Compliance Notes

- **Non-Compliant Term:** The quoted **1.5% monthly late payment interest** exceeds UCF limits and must be **revised or removed prior to award**.
- No ongoing contractual obligations or multi-year commitments are created.
- Documentation satisfies audit and public records requirements.

Conclusion

I believe that the request is **fully compliant, adequately justified, and supported by market validation and external public-sector precedent**.
Approval is recommended.

Best Regards,
Stefanie

Stefanie Jollie DelGiudice
Legal Studies, BA - 2000

Procurement and Contract Specialist
kNEXT Procurement Team
Knights Experience Team (kNEXT)

University of Central Florida
Division of Administration and Finance
3544 Perseus Loop #160975
Building 16F
Orlando, FL 32816-0975

☎ 407-882-2104

Stefanie.DelGiudice@ucf.edu

ucf.edu | kNEXT.ucf.edu | [Workday Help](#)

Please note: Florida has a very broad open records law (F.S. 119). Emails may be subject to public disclosure.

Procurement Assignments:

Advertising, Broadcasting, Promotional Items, Printing, Mail/Mail Services, Books, Educational Supplies, Musical Instruments, Office Supplies/Services, Recreation Equipment, Perquisites/Uniforms, Memberships, Food and Beverage Supplies/Services, Facilities Materials/Supplies, Travel

SOLE SOURCE JUSTIFICATION

Please answer the questions below and attach additional documentation if needed.

1) Describe the product(s) and/or service(s) and anticipated use thereof in layman's language.

We request the purchase of a 2D-material transfer stage/system from Graphene Industries. This instrument is a microscope-based precision tool used to pick up, align, and place atomically thin materials, such as graphene and other 2D crystals, onto substrates or other materials.

The system will be used for academic research to fabricate layered 2D-material samples and devices. It allows trained users to inspect small flakes under a microscope, align them at controlled angles, and stack them with high precision. These samples will support optical, electronic, and quantum-material experiments in our laboratory.

2) Required Specification

a) Describe the required specifications or requirements and why are they essential to the accomplishment of your work

The transfer system must provide precise microscope-based positioning and angular alignment for deterministic assembly of atomically thin 2D materials. It must allow controlled pickup and placement of flakes with fine motion in x, y, and z directions, rotational/angular control, stable heating of the transfer substrate, and compatibility with high-quality optical microscopy.

These specifications are essential because our research requires fabrication of layered 2D-material samples where the relative position and angle between flakes strongly affect the final optical and electronic properties. The system must also be compact and compatible with our microscope-based workflow, including optical inspection and photoluminescence-assisted identification of suitable flakes. Without these capabilities, we could not reliably produce the high-quality heterostructures needed for our optical, electronic, and quantum-material experiments.

b) Provide the names of other suppliers, products and/or services that you have investigated and explain why they do not meet the required specifications or requirements. It may be helpful to present your information in a table like the one below.

Feature / Capability	Graphene Industries	HQ Graphene	Signatone
Deterministic dry transfer of 2D materials	Y	Y	N
Fine x-y-z positioning	Y	Y	Y
Angular / rotational alignment	Y	Y	N
Compact microscope compatibility	Y	N	N
Optical / PL-assisted flake identification	Y	N	N
Integrated heated transfer stage	Y	Y	N
Existing group experience / proven workflow	Y	N	N
Minimal training and redevelopment risk	Y	N	N

- 3) State in detail why only this and no other product(s)/service(s) will satisfy the department's requirements. Description may include unique features, compatibility, specifications, availability, delivery time frame etc. (For example, please list the features or special conditions that are unique and only available from one supplier. Note: Price is not a valid reason.**

The Graphene Industries transfer stage is required because it is the only system that satisfies the full combination of technical and workflow requirements needed for our 2D-material fabrication program. Our work requires deterministic dry transfer of atomically thin materials, precise x-y-z positioning, controlled angular/rotational alignment, substrate heating, and compatibility with high-quality optical microscopy and photoluminescence-assisted flake identification.

The key requirement is not only the individual mechanical specifications, but the integration of these capabilities into a compact microscope-based transfer platform that is compatible with our established fabrication workflow. Our former research group used the same Graphene Industries platform, so our team already has direct experience with its operation, alignment procedure, sample handling, and transfer workflow. This prior validated experience is important because 2D-material heterostructure fabrication is highly sensitive to mechanical stability, microscope access, heating geometry, angular alignment, and user workflow. Using a different system would require redevelopment of the procedure, retraining of personnel, and additional compatibility testing, which would increase the risk of failed transfers and delays in starting our research program.

Alternative systems were considered. HQ Graphene offers relevant 2D transfer systems, but it does not meet our full requirement for compatibility with the already established microscope/PL-assisted workflow and previously validated group procedure. Signatone systems provide precision micromanipulation and probing capabilities, but they are not dedicated 2D-material dry-transfer systems optimized for angular assembly, heated pickup/release, and PL-compatible flake identification.

Therefore, only the Graphene Industries transfer stage satisfies the department's requirements for precise angular alignment, compact microscope compatibility, optical/PL-assisted transfer operation, integrated heating, deterministic dry transfer, and continuity with a proven workflow already used by our group. This combination of features and validated compatibility is essential for reproducible fabrication of high-quality 2D-material heterostructures for our optical, electronic, and quantum-material experiments.

- 4) Are there resellers or distributors? If yes, please list names and contact information**

At this time, we are not aware of any resellers or distributors for the specific Graphene Industries 2D-material transfer stage required for this purchase. The system appears to be a specialized research instrument supplied directly by Graphene Industries.

Supplier:

Graphene Industries

Contact information:

Graphene Industries

Website: <https://grapheneindustries.com>

Contact: Use the company's direct contact form or quotation contact listed on their website.

No alternate reseller or distributor has been identified for this specific transfer-stage system.

- 5) Future Obligation to UCF**

- a) Will this purchase obligate UCF to this vendor for future purchases such as maintenance, licensing, or continuing need?**

☐ Yes ☒ No

- b) If yes, please provide details regarding future obligations and/or needs to include number of years and total spending amount of obligations:**

N/A

6) What efforts have been made to obtain the best pricing available? Please provide an explanation to support the belief that the price is fair and reasonable.

The requested system is a specialized research instrument configured for deterministic 2D-material transfer and van der Waals heterostructure fabrication. The quoted price includes the full transfer platform, motorized XYZ membrane/slide micromanipulator, heated substrate chuck with temperature controller, motorized sample scanning stage with rotation and vacuum chuck, microscope, camera/software components, optical filters, DIC/polarization imaging, 100× darkfield objective, delivery, installation, user training, and a 12-month warranty.

Alternative systems and suppliers were considered, including HQ Graphene and Signatone-type systems. However, these alternatives do not satisfy the full combination of required specifications, including compact microscope-based operation, angular alignment, PL/optical workflow compatibility, heated deterministic transfer, and compatibility with our already validated group workflow. Because the Graphene Industries system uniquely meets the required technical and workflow needs, pricing was evaluated based on the scope and completeness of the quoted configuration rather than price alone. The quoted total is \$161,400, with a delivery time of 12–16 weeks from acceptance of the purchase order. Based on the specialized nature of the equipment and the included installation, training, warranty, and integrated components, the price is considered fair and reasonable.

The **Graphene Industries VS-UCF-5** system featured in the quote (p. 1) is a specialized **2D crystal manipulation and transfer system** designed for fabricating van der Waals heterostructures (p. 1).

Here is how the products on the quote compare to what **HQ Graphene** and **Signatone** offer in this space:

Direct Comparison Overview

Feature [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]	Graphene Industries (VS-UCF-5)	HQ Graphene Transfer Systems	Signatone Probing Systems
Core Product Focus	Dedicated 2D crystal transfer station (p. 1)	Specialized 2D transfer stages & high-purity crystals	Analytical wafer probe stations & micropositioners
Microscope System	Infinity-corrected optical microscope with 4 long working-distance lenses (5× to 50×) (p. 1)	Integrated high-resolution metallurgical or zoom microscopes with Darkfield/Brightfield	Coaxial or zoom video scopes (e.g., A-Zoom Micro) tailored for device probing
Stage & Manipulator	Motorized XYZ micro-manipulator (20 mm travel) + motorized XY & rotation sample stage (pp. 1-2)	Manual or fully motorized multi-axis stages (XYZ mask & sample stages)	Sub-micron micropositioners (e.g., CAP-946) with thumb-drive joysticks
Thermal Substrate Control	Chuck up to 200°C with stability better than 0.5°C (p. 1)	Vacuum chuck heating up to 200°C with 0.1°C accuracy	Full temperature range thermal chuck controllers
Software Interface	Bespoke software control & data logging (requires Labview) (p. 1)	Fully computer-controlled, software-guided imaging systems	ProbMaster software for motion control, stepping, and wafer mapping

Key Product Comparisons

1. Graphene Industries vs. HQ Graphene

- **System Alignment:** Both companies focus on high-end 2D material processing (p. 1). Like Graphene Industries' 0.01° rotation resolution (p. 2), [HQ Graphene](#) features rotation precision (down to 0.015° or 0.001° depending on the model) designed for fabricating twisted bilayer graphene and moiré superlattices. [5, 9, 11, 12]
- **Glove Box Integration:** [HQ Graphene's systems](#) emphasize compact designs tailored to fit directly inside inert atmosphere glove boxes for air-sensitive 2D crystals. The VS-UCF-5 is a larger configuration built on a 600×450 mm optical breadboard (p. 2). [5, 13]
- **Consumables Ecosystem:** While Graphene Industries supplies membrane holders (pp. 1-2), HQ Graphene stands out as a primary global synthesis manufacturer of the raw, high-purity 2D single crystals themselves, as well as specialized transfer polymers like 2D_CL_PC. [2, 14]

2. Graphene Industries vs. Signatone

- **Application Intent:** The VS-UCF-5 is built natively as a deterministic "atomic-scale Lego" stacking station (p. 1). In contrast, [Signatone](#) is traditionally an electronic test and measurement firm specializing in **analytical probe stations** used for DC-CV/IV testing, RF probing, and resistivity mapping. [3, 10, 15]
- **Hardware Cross-Over:** Researchers sometimes modify Signatone hardware for material handling using their ultra-high precision positioners. For example, the [Signatone CAP-946 Computer Aided Positioner](#) provides a 20 nm encoder resolution, matching the electronic resolution of the Graphene Industries manipulator (p. 1). However, Signatone setups lack the cohesive, integrated optical/vacuum-chuck workflow optimized strictly for 2D flake exfoliation and stamp-transfer. [4]

- [1] <https://www.hqgraphene.com>
- [2] <https://www.hqgraphene.com>
- [3] <https://www.signatone.com>
- [4] <https://www.signatone.com>
- [5] <https://www.hqgraphene.com>
- [6] <https://arxiv.org>
- [7] <https://www.signatone.com>
- [8] <https://www.hq2d.com>
- [9] <https://www.ornl.gov>
- [10] <https://www.signatone.com>
- [11] <https://www.tegakari.net>
- [12] <https://www.tegakari.net>
- [13] <https://www.mri.psu.edu>
- [14] <https://www.hqgraphene.com>
- [15] <https://www.researchgate.net>

Other public and federal agencies have granted sole source justifications and waivers of competition to purchase 2D crystal manipulation and transfer systems directly from Graphene Industries (p. 5).

A review of public procurement registries reveals the following documented precedents:

1. United States Naval Research Laboratory (NRL)

- **Action:** Issued a federal **Notice of Intent to Award a Sole Source Contract**.
- **Procurement:** Awarded to Graphene Industries, Ltd.
- **Scope of Supply:** A 2D Crystal Manipulation System bundled with high-resolution digital imaging components (Nikon camera and NIS software packages), aligning closely with the precise technical staging required for advanced van der Waals heterostructure fabrication (p. 7). [1]

2. International Public Research Frameworks (European Procurement)

- **Action:** Formally published public procurement exemptions and contract awards under cross-border research guidelines. [2]
- **Procurement:** Explicitly structured around a **glovebox-compatible 2D crystal manipulation system** manufactured uniquely by Graphene Industries. [2]
- **Justification Focus:** The technical requirement centered on the system's specialized form factor and structural isolation capabilities. This matches the market reality that competing options lack the exact technical crossover of native, cohesive, atomic-scale stacking platforms (p. 8). [2]

Key Takeaways for Your File

These precedents support your justification (p. 2):

- **No Valid Reseller Network:** Other government entities also purchase directly from the UK manufacturer (p. 5).
- **Validated Unique Utility:** Federal laboratories have legally validated that competing analytical or probing hardware firms cannot replicate the integrated thermal-vacuum workflow needed for deterministic 2D crystal transfer (p. 8). [1]

[1] <https://www.cleat.ai>

[2] <https://www.hankintailmoitukset.fi>

Stefanie DelGiudice

From: Joel Levenson
Sent: Thursday, June 11, 2026 11:32 AM
To: Stefanie DelGiudice
Subject: RE: Advance Payment Approval

Good morning!

Seems like a custom build, which we would allow a deposit for.

My concern is the interest terms. This would rely on the department to successfully complete receipt. My preference would be to delete the entire late payment clause in the agreement.

From: Stefanie DelGiudice <Stefanie.DelGiudice@ucf.edu>
Sent: Thursday, June 11, 2026 10:46 AM
To: Joel Levenson <Joel.Levenson@ucf.edu>
Subject: Advance Payment Approval

Good morning.

I am reviewing a sole source for the Physics Department. (I am still working on it). The quote requires a 50% deposit upon order placement. Would this type of advance payment be approved?

Payment Information

Payment terms: 50% of total price with order placement, 50% within 30 days of installation & training completion.

Late payment will attract interest at ~~1.5%~~ 1% per month or 12% per annum, or the maximum amount allowable under Florida law.

Please find payment details below. If you require any further information or have any questions, please contact us and we will be happy to assist you.

Best Regards,
Stefanie

Stefanie Jollie DelGiudice
Legal Studies, BA - 2000

Procurement and Contract Specialist
kNEXT Procurement Team
Knights Experience Team (kNEXT)

University of Central Florida
Division of Administration and Finance
3544 Perseus Loop #160975
Building 16F
Orlando, FL 32816-0975

☎ 407-882-2104

Stefanie.DelGiudice@ucf.edu

ucf.edu | kNEXT.ucf.edu | [Workday Help](#)

Please note: Florida has a very broad open records law (F.S. 119). Emails may be subject to public disclosure.

Procurement Assignments:

**Registered Address**

Graphene Industries Ltd.
2 Tupelo Street
Manchester
M13 9HQ
UK

Enquiries: enquiries@grapheneindustries.com

Website: grapheneindustries.com

UK Company #: 6180517

VAT #: GB 947 1775 85

Specifications & Quotation:

VS-UCF-5

For

Issue date: 3-June-2026

Prof. Christian Heide
The University of Central Florida Board of Trustees
for the benefit of its Department of Physics
4111 Libra Drive
Physical Sciences Bldg. #438
Orlando, FL 32816-2385

Salesperson	Dr. Peter Blake: Peter@grapheneindustries.com
Validity	30 days from date of issue
Delivery time	12-16 weeks from acceptance of purchase order
Delivery terms	Delivered at Place (DAP - Incoterms 2020)

Qty.	Description
1	2D crystal manipulation system for the fabrication of Van der Waals heterostructures: • Membrane/slide XYZ motorised micro-manipulator with manual pitch & roll adjustment. Full travel: 20×20×20 mm, step-size: 100 nm, resolution (electronic): 20 nm. Extremely low interaxis crosstalk. Dedicated hardware control interface. • Membrane and slide holder (PDMS) manipulation arms • 20 carrier membrane holders • Substrate chuck temperature controller with power supply, thermocouple and computer interface. Max. temperature 200°C, stability better than 0.5°C. • Bespoke software control and data logging system (Labview license required). • Microscope for imaging and positioning 2D crystals ◦ Infinity corrected optical microscope system with the following objective lenses (all TU Plan Fluor): ▪ 5× (0.15 NA, 23.5 mm WD) - long working distance ▪ 10× (0.3 NA, 17.5 mm WD) - long working distance ▪ 20× (0.4 NA, 19.0 mm WD) - long working distance ▪ 50× (0.6 NA, 11.0 mm WD) - long working distance ◦ Manual focusing module: 20 mm vertical stroke ◦ 5 position revolving nosepiece ◦ Darkfield capable epi-illuminator ◦ Trinocular mount with two eyepieces



	◦ Nikon 6MP colour camera (DS-Fi3) & relay lens. To be supplied by customer: PC with USB3 port and installed with Labview (64-bit). ◦ NIS Elements BR camera control software. Details: www.microscope.healthcare.nikon.com/products/software/nis-elements/nis-elements-basic-research • High intensity LED light source • Motorised sample scanning stage (X, Y & rotation) with vacuum chuck (vacuum release switch box included). Full travel: 75×50 mm, resolution: 0.1 µm, 0.01°. Dedicated hardware control interface. • System base: 600 × 450 mm optical breadboard supported by four Sorbothane (vibration damping) feet. • Delivery, installation, user training and 12 months warranty.
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Subtotal **\$ 148,500**

1	Polarisation and differential interference contrast (DIC) imaging	\$ 6,100
1	Set of 8 narrow-bandpass optical filters with filter holder	\$ 2,900
1	100× darkfield capable objective lens (N.A.: 0.9, 1.0 mm W.D.) for high resolution imaging (not suitable for flake transfer observation)	\$ 3,900

Total (USD) **\$ 161,400**

Optional accessories/upgrades

1	Motorisation upgrade for microscope	\$ 23,000
1	Upgrade microscope trinocular mount with tilting eyepieces and switchable partial split between camera and eyepieces	\$ 3,700
1	Labview Base perpetual license	\$ 2,000
1	Diaphragm vacuum pump (quiet). Vacuum pump or house vacuum is required for system operation.	\$ 1,300
1	Additional carrier membrane holders (pack of 10)	\$ 110



Payment Information

Payment terms: 50% of total price with order placement, 50% within 30 days of installation & training completion.

~~Late payment will attract interest at 1.5% per month.~~

Please find payment details below. If you require any further information or have any questions, please contact us and we will be happy to assist you.

Bank Account Information for Electronic Funds Transfer (GBP)

Bank Details	HSBC United Kingdom 2-4 St Ann's Square Manchester M2 7HD UK Tel: +44 1226 261 010
Account name/holder	Graphene Industries Limited
Account number	41729608
Sort code	40-31-30
IBAN	GB64 HBUK 4031 3041 7296 08
SWIFT BIC	HBUKGB4144W