



Aster Technologies

Integrated Graphene & Photonic Intellectual Property Overview Memorandum

Aster Technologies has developed a vertically integrated graphene and photonic materials platform spanning feedstock conversion, photonic-grade material upgrading, wafer-scale substrates, and device-level systems.

The portfolio is intentionally structured to support next-generation photonic switching, plasmonic devices, and quantum-adjacent architectures, while retaining strong optionality across energy, data-center infrastructure, and advanced materials.

Aster represents not only a secure and scalable graphene substrate supply, but a deeply aligned technology stack designed to maximize photonic device yield, performance, and manufacturability at scale.

This summary is intended to support strategic alignment, equity-based collaboration, and licensing discussions.

Upstream Graphene Supply Designed for Photonics

Aster's platform begins with purpose-built graphitic carbon production engineered specifically for downstream photonic and electronic applications.

Key characteristics include high-yield conversion of heterogeneous carbon feedstocks, reactor architectures optimized for uniform field exposure, inline process monitoring, and modular scale deployment.

Photonic-Grade Graphene as a Deliberate Bridge Layer

Aster has developed a dedicated material upgrading and conditioning layer focused on meeting photonic foundry requirements including layer control, defect minimization, and wafer compatibility.

Wafer-Scale Graphene Substrates for Foundry Integration

Core processes support wafer-scale transfer, planarization, encapsulation, and integration with photonic foundry workflows.

Device-Level Enablement

The platform extends into graphene-enabled photonic and plasmonic devices including ultra-fast switches, modulators, and plasmon-polariton components.

Platform Optionality

The platform also supports energy systems, data-center power reliability, advanced thermal materials, and closed-loop recycling.

Strategic Fit for Equity-Based and Licensing Collaboration

Astera views collaboration with True Photonic as platform-level alignment supported by equity exchange and licensing rather than simple supply agreements.

Titles and Descriptions

PP1, “Rectangular Microwave-Assisted Pyrolysis with Photolysis Pre-Treatment,” introduces a continuous microwave and photolysis process for converting heterogeneous plastics into graphene-rich carbon. It enables modular, low-oxygen, catalyst-assisted graphitization at commercial scale.

PP2, “Process for Photonic Grade Graphene,” advances purification, plasma annealing, and encapsulation techniques that achieve low-defect, photonic-grade graphene layers suitable for wafer foundries. Together, PP1 and PP2 form the foundation of Astera’s materials pipeline.

PP3, “Frontier Enhanced Hybrid Graphene Supercapacitor Battery with AI-Driven Plasma Conditioning,” combines the high-power density of supercapacitors with the energy density of batteries through graphene hybrid electrodes and intelligent plasma conditioning.

PP4, “Hybrid Plasma Regenerated Graphene Energy Systems,” extends this by enabling in-situ plasma regeneration of electrodes, prolonging lifespan and reducing maintenance costs.

PP5, “Plasma Regenerated Graphene Hybrid UPS Systems,” applies these advancements to data center ride-through systems and edge power applications. Collectively, PP3–PP5 define Astera’s graphene-based energy storage and continuity platform.

PP6, “Plasma-Enhanced Graphene Systems for Computing, Energy, and Smart Devices,” and

PP7, “Plasma-Enhanced Graphene Systems for Quantum Computing,” introduce precision plasma engineering to tune graphene’s band structure, defect profiles, and heterostructure interfaces. These serve as performance enablers for Astera’s photonic and quantum devices.

PP8, “Plasma-Enhanced Graphene Systems for Biomedical and Healthcare Devices,” adapts the same plasma-functionalization methods for biosensors, antimicrobial coatings, and neural interface wearables, opening pathways into the medical sector.

PP9, “Closed Loop Graphene Recycling Systems,” creates a sustainable, circular ecosystem for recovering and reactivating graphene from spent materials and device waste. This patent links directly with ESG and tokenized carbon credit models, providing cost savings and environmental compliance across all product lines.

PP10, “Graphene Devices for Light Based Computing,” defines modulators, photodetectors, and optical logic gates that leverage graphene’s ultrafast carrier dynamics.

PP11, “Process of Generating Diamonds from Graphene,” details methods for transforming graphene into diamond films for use as heat spreaders and radiation-hard substrates.

PP12, “Wafer Scale Graphene Substrates and Methods for Photonic Foundry Applications,” enables wafer-level transfer, alignment, and encapsulation of graphene for integration with photonic foundry production lines. These three patents constitute the materials-to-wafer backbone of Astera’s Poovey Switch and photonic computing roadmap.

PP13, “Multi Machine Scale Deployment of Plastics Pyrolysis System,” scales PP1’s process into multi-reactor industrial plants with AI-based analytics and safety systems, enabling regional graphene production hubs.

PP14, “Graphene Plasmon Polariton Devices and Systems for Light Based Computing,” defines sub-wavelength, femtosecond photonic switches and filters for data center and AI accelerator applications, positioning Astera as a frontier innovator in light-speed computation.

Provisional Patent Portfolio Suggested Valuations

This section provides an indicative, non-binding valuation of the Astera Technologies provisional patent portfolio.

The valuation is intended for strategic, licensing, and investment discussions and does not constitute a formal 409A or fairness opinion.

Valuation Methodology - The portfolio is valued as an integrated platform rather than as isolated patents, using a hybrid methodology that considers:

- Replacement cost and development risk
- Comparable advanced materials and photonic IP transactions
- Forward licensing potential and platform optionality

Aggregate Portfolio Valuation (Pre-Issued)

Indicative pre-issuance valuation of the provisional patent portfolio:
\$180 million – \$320 million

This range reflects the provisional status of the filings, breadth of claims, and applicability across photonics, energy, and advanced materials markets.

Conversion to issued utility patents is expected to result in a material step-up in valuation.

Valuation by Patent Cluster

1. Upstream Graphene Conversion & Scale (PP1, PP13): \$30M – \$55M
2. Photonic-Grade Graphene Conditioning (PP2, PP6–PP8): \$45M – \$80M
3. Wafer-Scale Substrates & Foundry Integration (PP12): \$35M – \$60M
4. Photonic, Plasmonic & Light-Based Computing Devices (PP10, PP14): \$40M – \$75M
5. Energy Storage, UPS & Regeneration Systems (PP3–PP5): \$20M – \$35M
6. Circular Economy & Diamond Transformation (PP9, PP11): \$10M – \$15M

Strategic Premium

Due to vertical integration, interdependent claims, and manufacturability enablement, the portfolio may justify a strategic control premium of 25%–50% for exclusive licensees or acquirers.

Issued Patent Upside

Provisional Portfolio: \$180M – \$320M
Issued Utilities: \$400M – \$750M+
Issued with Revenue Traction: \$1B+ Platform IP

Forward-Looking Statements

Statements included in this Intellectual Property Summary (“Memorandum”) do not relate to present or historical conditions and are “forward-looking statements” within the meaning of the Safe Harbor provisions of the Private Securities Litigation Reform Act of 1995 (the “1995 Reform Act”). Additional oral or written forward-looking statements may be made by us from time to time and such statements may be included in documents other than this Memorandum. Such forward-looking statements involve risks and uncertainties that could cause results or outcomes to differ materially from those expressed in such forward-looking statements. Forward-looking statements in this Memorandum and elsewhere may include, without limitation, statements relating to our plans, strategies, objectives, expectations, intentions and adequacy of resources and are intended to be made pursuant to the Safe Harbor provisions of the 1995 Reform Act.