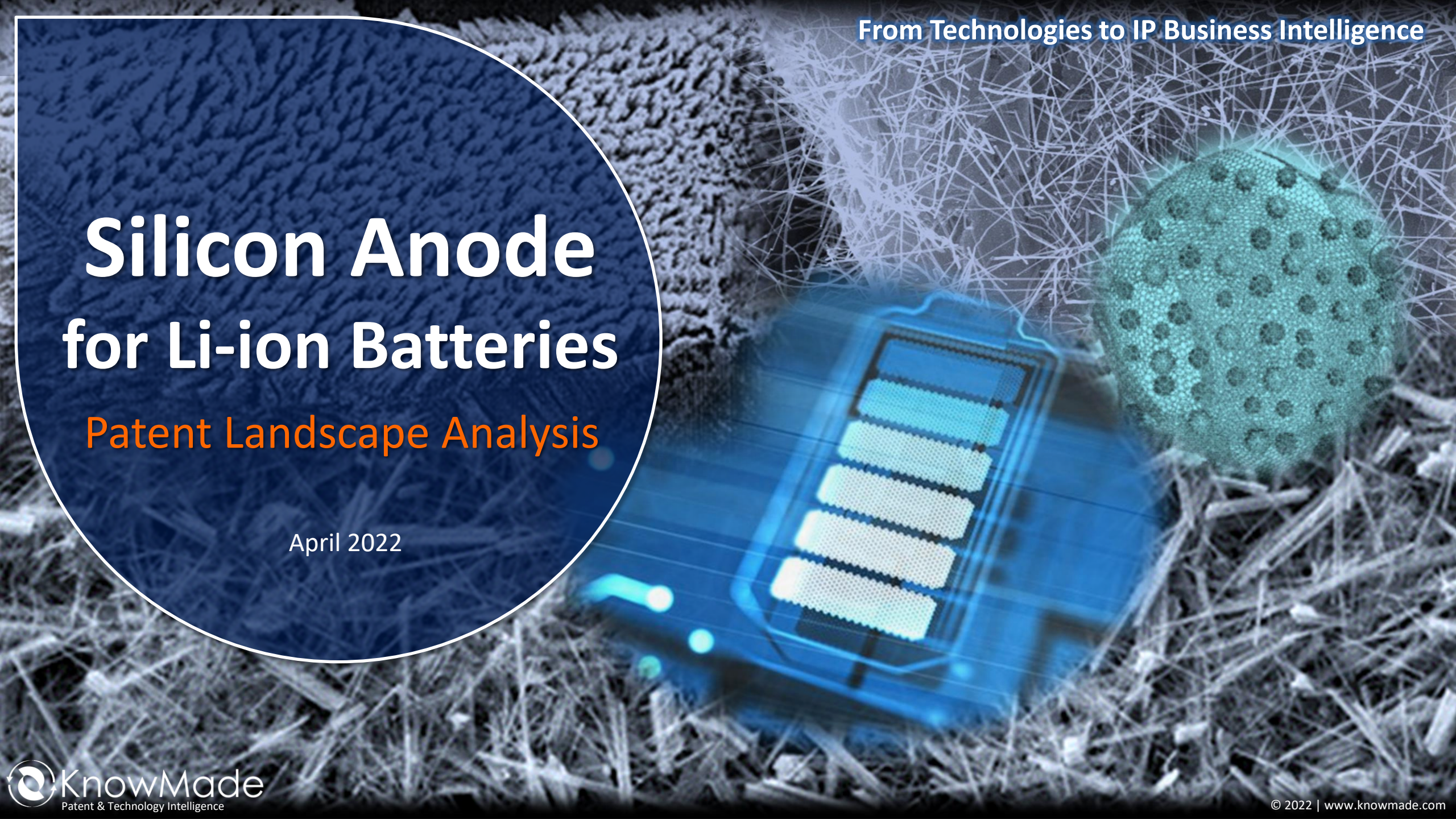
From Technologies to IP Business Intelligence

Silicon Anode for Li-ion Batteries

Patent Landscape Analysis

April 2022



KnowMade
Patent & Technology Intelligence

TABLE OF CONTENTS

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KnowMade

Knowmade is a Technology Intelligence and IP Strategy consulting company specialized in analysis of patents and scientific information. The company helps innovative companies and R&D organizations to understand their competitive landscape, follow technology trends, and find out opportunities and threats in terms of technology and patents.

Knowmade's analysts combine their strong technology expertise and in-depth knowledge of patents with powerful analytics tools and methodologies to turn patents and scientific information into business-oriented report for decision makers working in R&D, Innovation Strategy, Intellectual Property, and Marketing. Our experts provide prior art search, patent landscape analysis, scientific literature analysis, patent valuation, IP due diligence and freedom-to-operate analysis. In parallel the company proposes litigation/licensing support, technology scouting and IP/technology watch service.

Knowmade has a solid expertise in Compound Semiconductors, Power Electronics, Batteries, RF Technologies & Wireless Communications, Solid-State Lighting & Display, Photonics, Memories, MEMS & Solid-State Sensors/Actuators, Semiconductor Manufacturing, Packaging & Assembly, Medical Devices, Medical Imaging, Microfluidics, Biotechnology, Pharmaceutics, and Agri-Food.

INTRODUCTION

Silicon as anode material: the hope of outstanding performances

- New rules and regulations on vehicle CO_2 emissions are forcing car manufacturers to accelerate their transition towards electric vehicles. Electric vehicle performances (autonomy, speed, safety) mainly rely on batteries. Automotive represents a huge new potential market for the battery industry – that's why companies operating in this field are investing a lot to meet their requirements. Driven by the rush for electrical vehicles with greater autonomy, power and safety, R&D developments in the battery field are constantly increasing and multiplying at all supply chain levels (electrode, electrolyte, separator, cell pack and systems).

- One solution envisioned to **improve battery performances** (i.e. energy and power density, charge duration, life duration, performances in extreme environments) is to develop **new electrode materials** and electrolytes. On the anode side, **silicon is a promising material** to replace graphite and improve battery performances. Indeed, **silicon anode-based Li-ion batteries** show **higher electro-chemical performances** (i.e. high energy density, high gravimetric capacity, high volumetric capacity, appropriate thermodynamic lithiation potentials and high average voltage of Si). Moreover, silicon is **environmentally friendly** and **non-toxic**. Lastly, there are **abundant reserves** of silicon in the Earth's crust (raw material), and for several years, the price of silicon has been relatively low. However, the use of silicon still has two **major drawbacks** to overcome: **poor cyclability** due to the high-volume expansion of silicon, leading to huge stress generation during charge/discharge and mechanical collapsing of the electrodes, as well as the **poor intrinsic electronic conductivity** of silicon. Major challenges for the adoption of silicon-based anodes in Li-ion batteries include **improving the cycle and electrochemical performances** of silicon anode materials and **improving the material synthesis** (i.e. increase yields, reduce costs, lower impact on the environment, etc.). The main technical solutions envisioned to solve these issues are the **development of various silicon-based materials** (e.g. nanostructured, composite, highly porous, high-density materials etc.) and the **development of electrolytes and binders** adapted to silicon anode materials.

- R&D laboratories and industrial companies quickly saw the potentiality of silicon as an anode material for Li-ion batteries, thus big investments have been made since the early 2000s to push it to the market. Today, the use of silicon-based anodes in Li-ion batteries is becoming a reality. In 2021, IdTechEx estimated that **$1.9B in funding** has now made its way into **silicon anode start-ups** and forecast that demand for silicon anode materials will reach $12.9B by 2032. Several material manufacturers (**Advano**, **Sila Nanotechnology**, **Elkem**, **Group14**, **NanoGraf**, **OneD Materials**, **Nexeon**, etc.) have announced the commercial production of silicon active materials for Li-ion batteries. Several battery manufacturers have also announced the commercial availability of silicon anode Li-ion cells (**Amprius**, **Sionic Energy (formerly NOHMS)**, **Farasis Energy**, **Enovix**, **StoreDot**, **Samsung**, **Panasonic**, **PPES**, **Murata**, **Enevate/EnerTech**, etc.). On the car-makers side, we are witnessing strategic acquisitions and partnerships. **Tesla** acquired battery manufacturer **Maxwell Technologies** and battery start-up **SiLion** in 2019 and 2021 respectively. In 2021, **PPES** (joint venture between **Toyota** and **Panasonic**) and **Nexeon** announced a partnership on silicon anode development. In the same year, **StoreDot** announced a strategic framework agreement with **EVE Energy** and a partnership with **Group14 Technologies** to accelerate the time to market of **StoreDot**'s XFC lithium-silicon cells for electric vehicles. The silicon battery market is estimated to grow from $38M in 2020 to **$177M by 2025 (CAGR of 36.2%)** and **$270.3M by 2027 (CAGR of 28.6%).**

- In such a highly competitive and dynamic environment, it becomes increasingly critical to have good knowledge of the patent landscape and understand the strategy of the different players. As such, Knowmade publishes reports and sets up monitoring services in order to track and analyze the competitors' R&D and IP strategies, to reveal where industry leaders, newcomers and start-ups are focused, and give an early view into the strategies they are pursuing, technologies they are investing in and products they are building.

INTRODUCTION

Scope of the report

- This report provides a detailed picture of the patent landscape related to **Silicon Anode for Li-ion Batteries,** covering the whole value chain (anode materials, anode electrode, battery cells, electrolytes, binders, etc.)
- We have selected and analyzed more than **24,700 patents and patent applications** published **worldwide** up to **June 2021**, representing more than **12,300 patent families** (inventions) relevant to the scope of this report.

Included in the study

Excluded of the study

SILICON ANODE Li-ION BATTERY

SUPPLY CHAIN SEGMENTS

- Anode materials
- Anode electrodes
- Battery cells
- Binder
- Electrolyte
- Battery packs
- Charging technologies
- Recycling

TYPE OF SILICON

- Pure Silicon
- Doped Silicon
- Silicon in a list of active materials
- Silicon alloys
- SiOx

TYPE OF MATERIALS

- Pure Silicon
- Composite materials
  - Core-shell
  - Composite without a shell
    - Carbon
    - Inorganic
    - Organic
    - Others

INTRODUCTION

Key features of the report

- The report provides **essential patent data** for **batteries using silicon anode**, from **electrolyte and electrode materials to battery cells**.
- It provides **in-depth patent analyses** of **key technologies** and **key players** including:
  - Main IP dynamics and key trends.
  - IP leaders, most active players and newcomers.
  - IP portfolio strength of key players, and their technology/application focus.
  - Time evolution of patents filings by company, countries, and technology.
  - Current legal status of patents.
  - Joint developments, IP collaborations and IP transfers between key organizations.
  - Insights into the status of technologies, identifying trends for each technology/application.
  - Key patents.

- This report also includes an extensive **Excel database** with the **12,300+ patent families** analyzed in this study. This useful patent database allows for **multi-criteria searches** and includes patent publication numbers, **hyperlinks to an updated online database** (original documents, legal status, etc.), priority date, title, abstract, patent assignees, patent's current legal status, and **segments** (anode materials, anode, battery cells, binder, electrolyte, etc.).

Disclaimer: This report **does not provide** any insight **analyses or counsel regarding legal aspects** or the **validity** of any individual patent. Knowmade is a research firm that provides technical analysis and technical opinions. Knowmade is not a law firm. The research, technical analysis and/or work proposed or provided by Knowmade and contained herein is not a legal opinion and should not be construed as such.

INTRODUCTION

Why study the patent landscape

Understanding the **competitive landscape** and **technology developments** from a **patent perspective**

- **Key IP players** (key patents, IP strategy, technology roadmap)
- **Newcomers** (technologies and markets of interest)
- **Technology trends & Emerging technologies**
- **Benchmark patent portfolios** (competitors' strength & weakness)
- **Key patents** (blocking, valuable)
- **Key technical solutions**
- **Risks** (patent infringement, new entrants, etc.)
- **Opportunities** (partnership, technology acquisition, licensing, etc.)

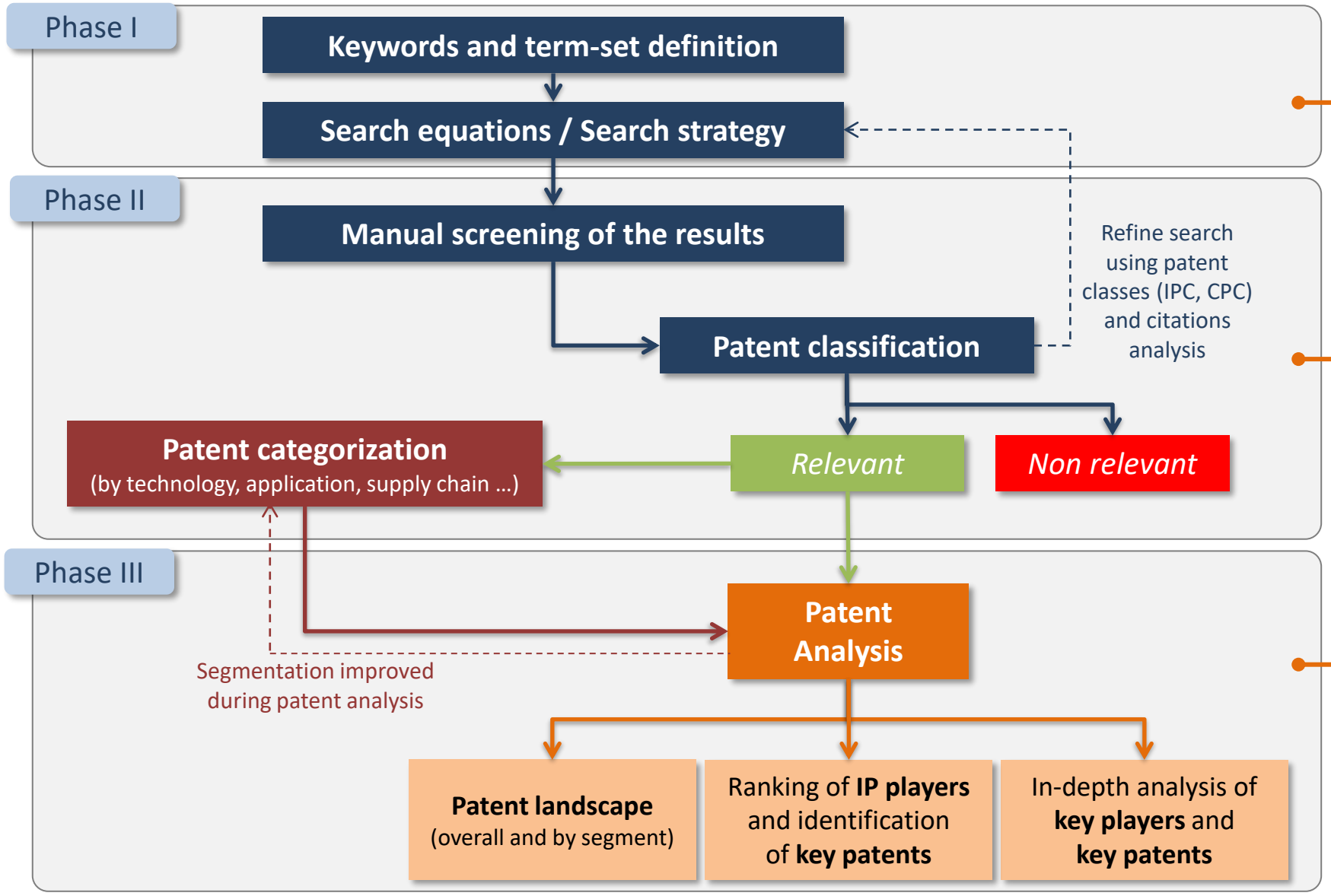
Perfectly complement market research

Give another point of view of the competitors, technologies and markets

Links between patents and
- Key market players
- Supply chain
- Technology Readiness Levels (TRL)
- Market product
- Emerging technologies/applications
- Forecast

METHODOLOGY

Methodology for patent search, selection and analysis



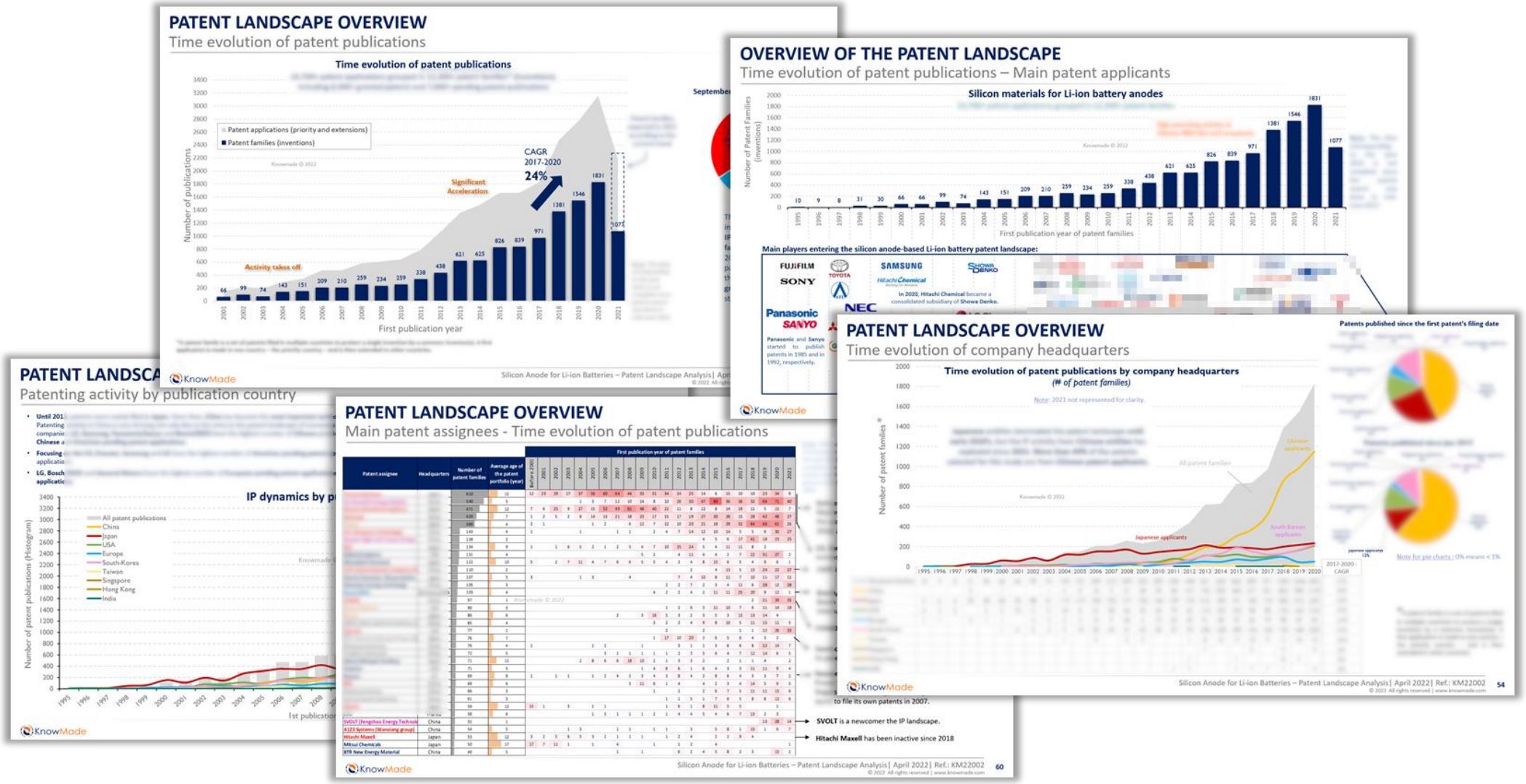
Worldwide patent database (Questel-ORBIT)
Provides 100+ million patent documents from 100 offices (USA, Japan, Europe, China, Korea, Taiwan, Hong Kong, Singapore, etc.)

IP analysts with PhD degree combining **technical** and **patent expertise**. **Manual screening** of patent pools with patent classification between relevant & non relevant patent families based on their technical content & scope of the claims. **Categorization** of relevant patent families by technology, application or supply chain.

Analytics tools and **proprietary methodologies** dedicated to **IP business intelligence** including quantitative and qualitative analysis.

PATENT LANDSCAPE OVERVIEW

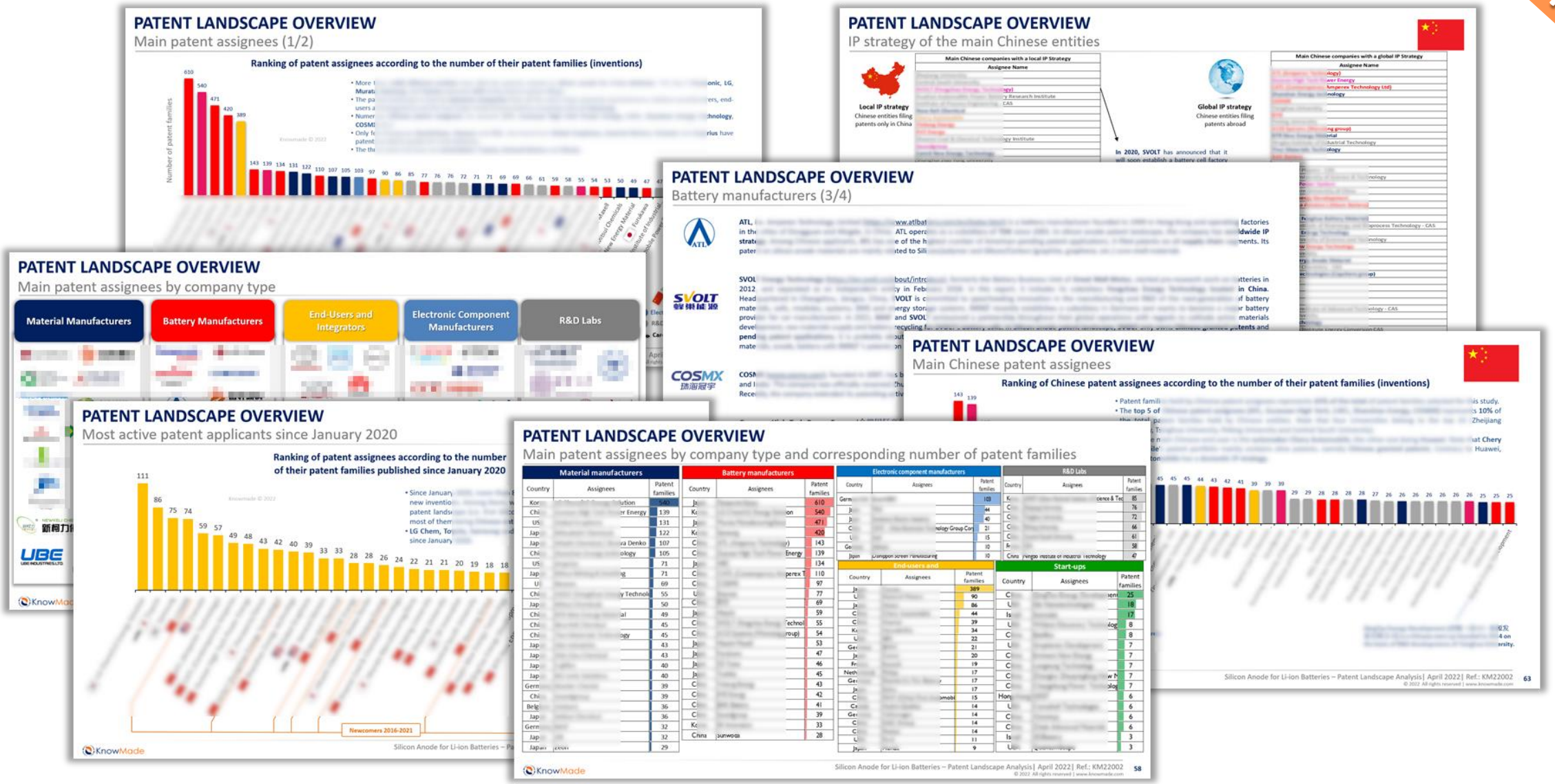
IP dynamics



PATENT LANDSCAPE OVERVIEW

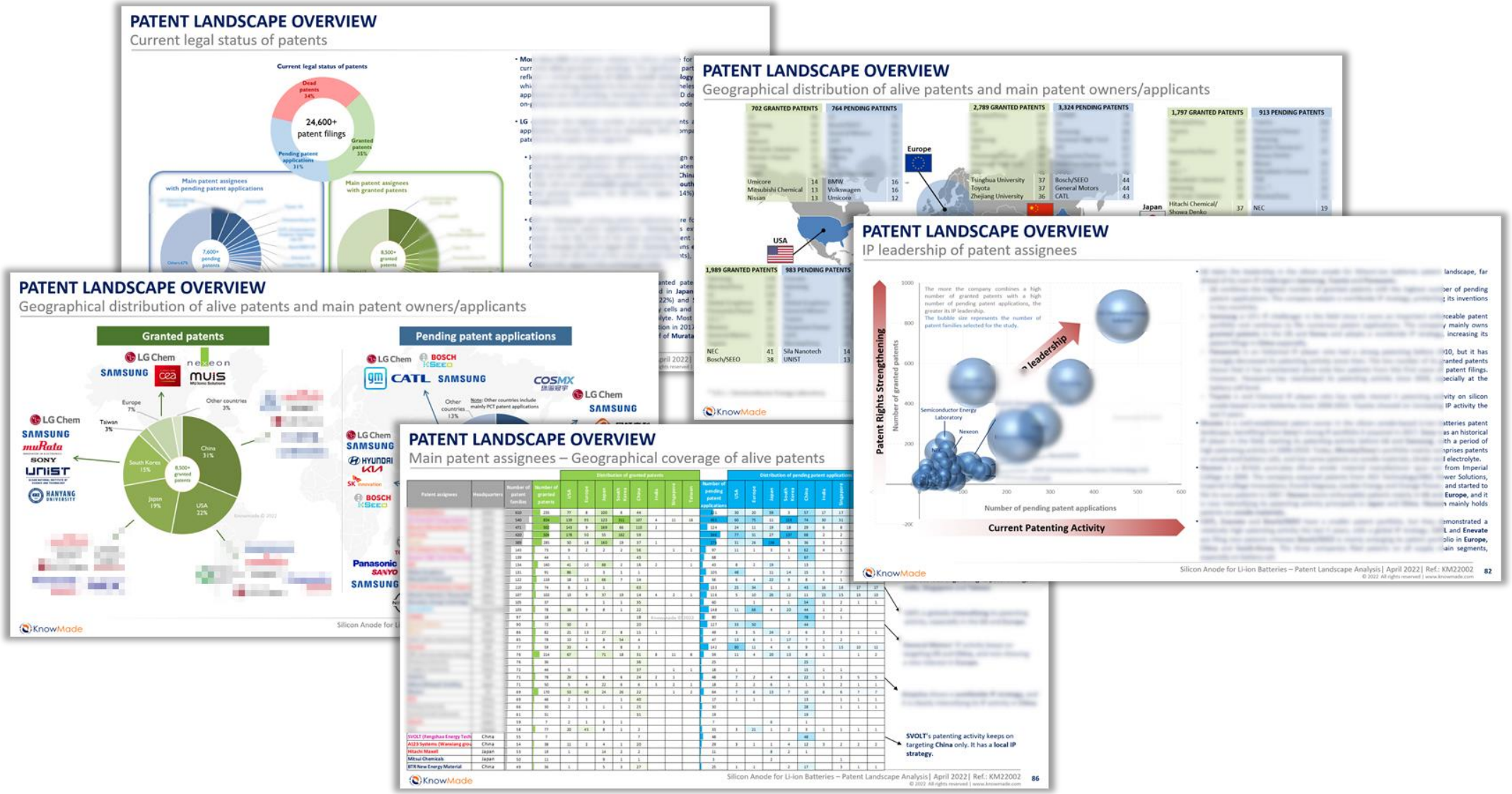
Main IP players & newcomers

SAMPLE



PATENT LANDSCAPE OVERVIEW

Patent legal status and geographical coverage



PATENT SEGMENTATION

Patents categorized by supply chain segments

The patents selected for the corpus of this report have been categorized as shown in the table.

Note that patents can belong to multiple segments.

Segments	Main claim content
Anode material	Composition and/or manufacturing methods of anode materials, particles or layers containing Silicon with or without an additional material.
Anode	Composition and/or manufacturing methods of anode layers containing silicon.
Binder	Composition and/or manufacturing methods of binder / polymer used in anode layers containing silicon
Battery cell	Composition and/or manufacturing methods of battery cells with silicon anodes
Electrolyte	Composition and/or manufacturing methods of electrolytes used with silicon anodes
Equipment	Equipements used to manufacture electrode materials, electrodes, batteries, etc.
Others	Inventions that are not included in the above-mentioned segments (battery packs, battery management systems, recycling, etc.).

PATENT CATEGORIZED BY SUPPLY CHAIN SEGMENTS

IP dynamics and main IP players by segment

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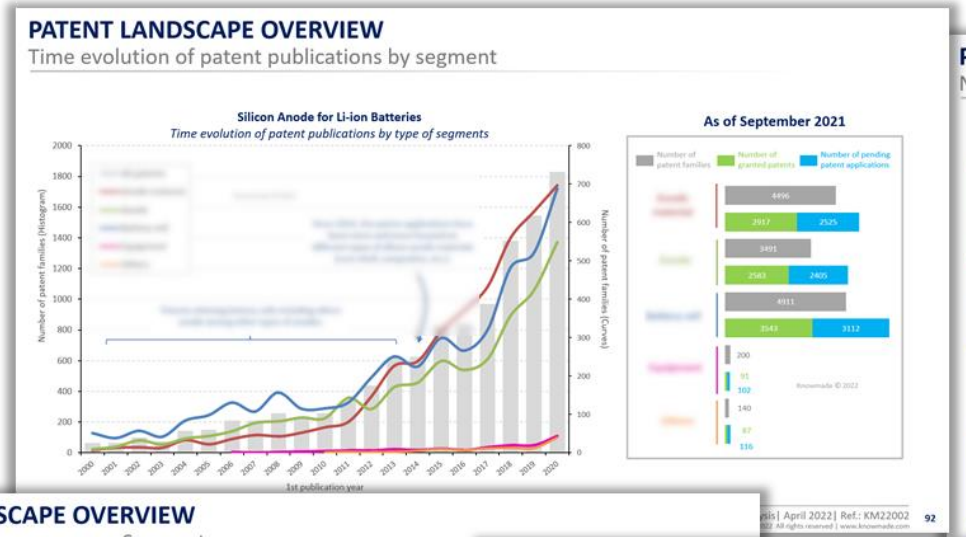
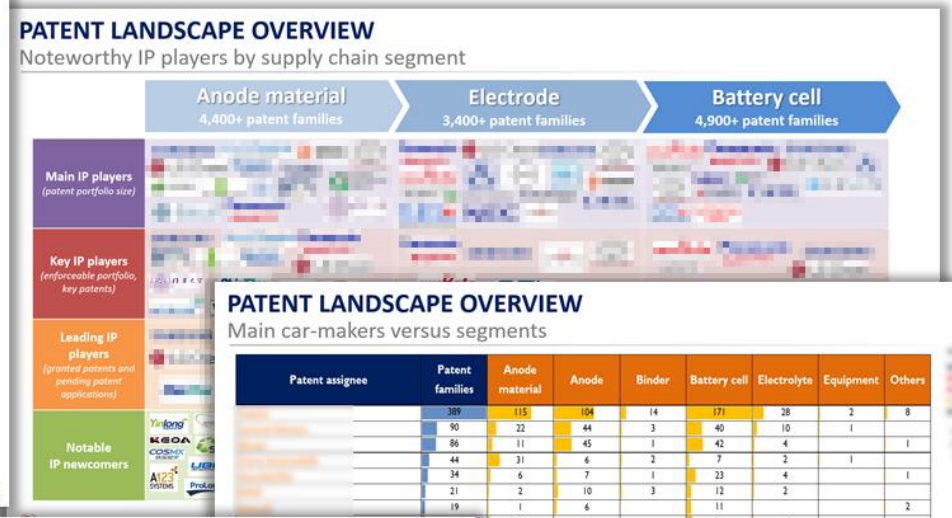
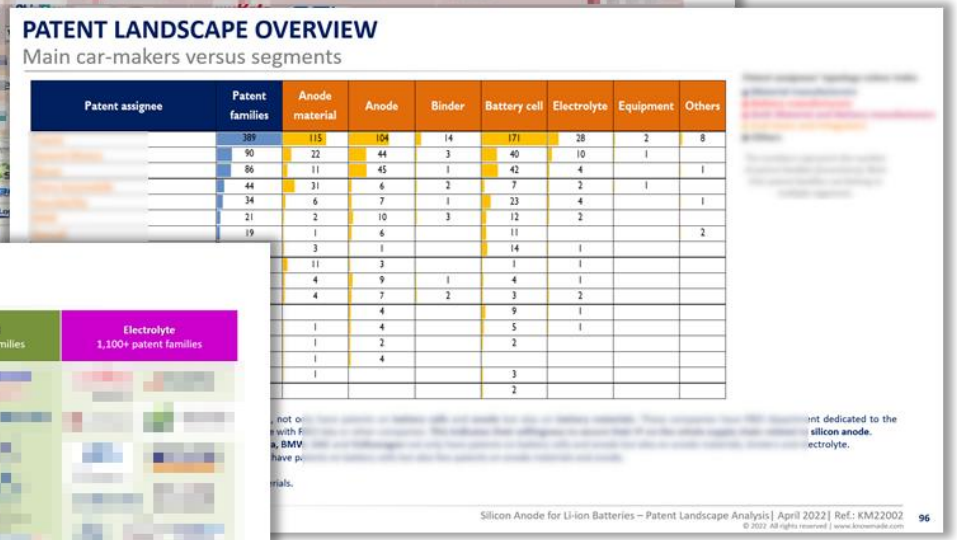
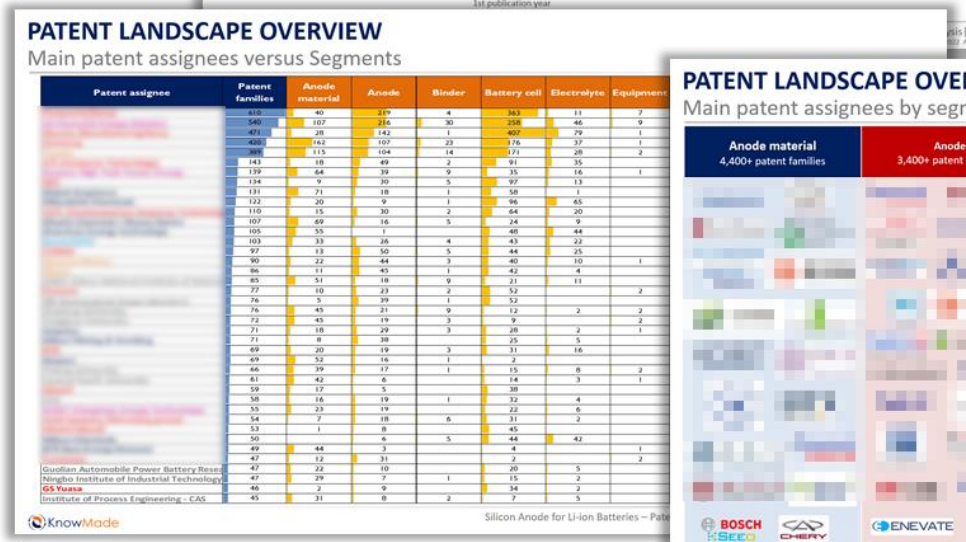
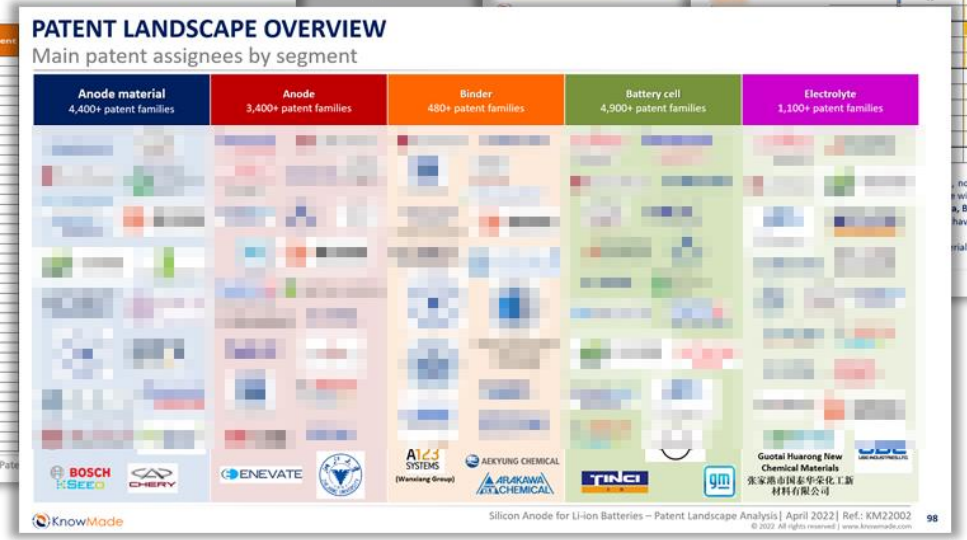






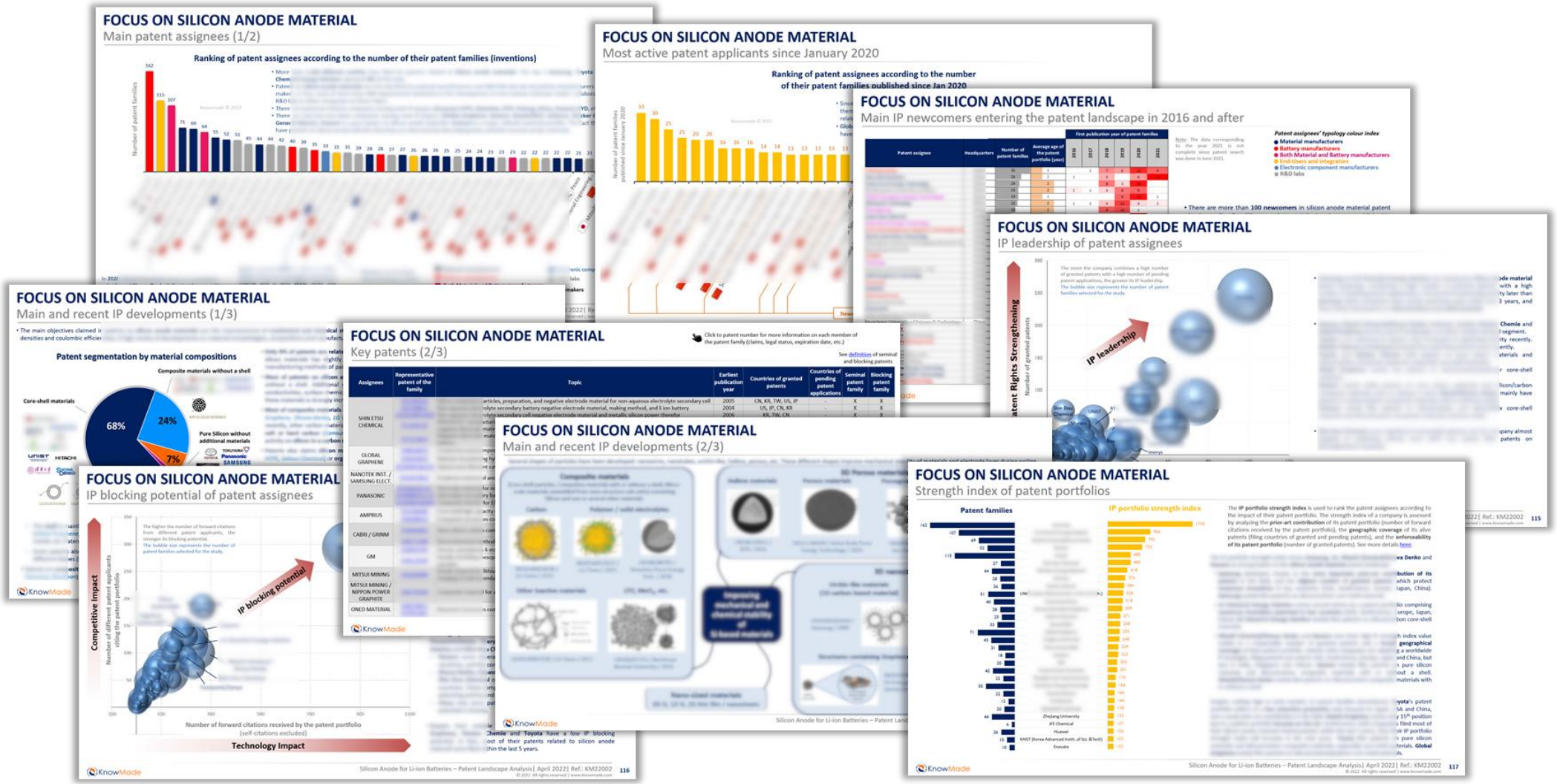




FOCUS ON SILICON ANODE MATERIALS

Key IP players, IP newcomers, key patents, recent IP development, etc.

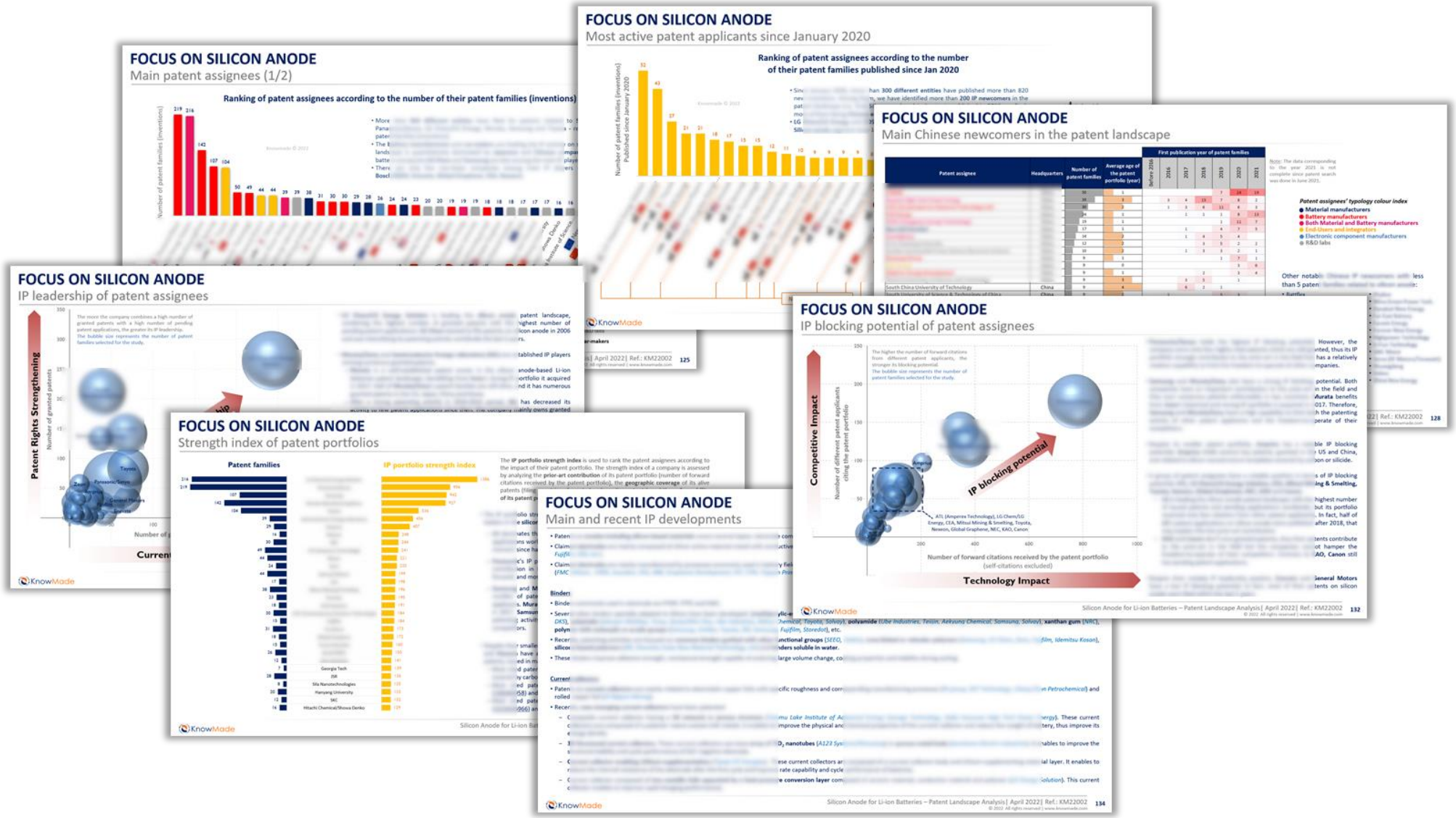
SAMPLE



FOCUS ON SILICON ANODE

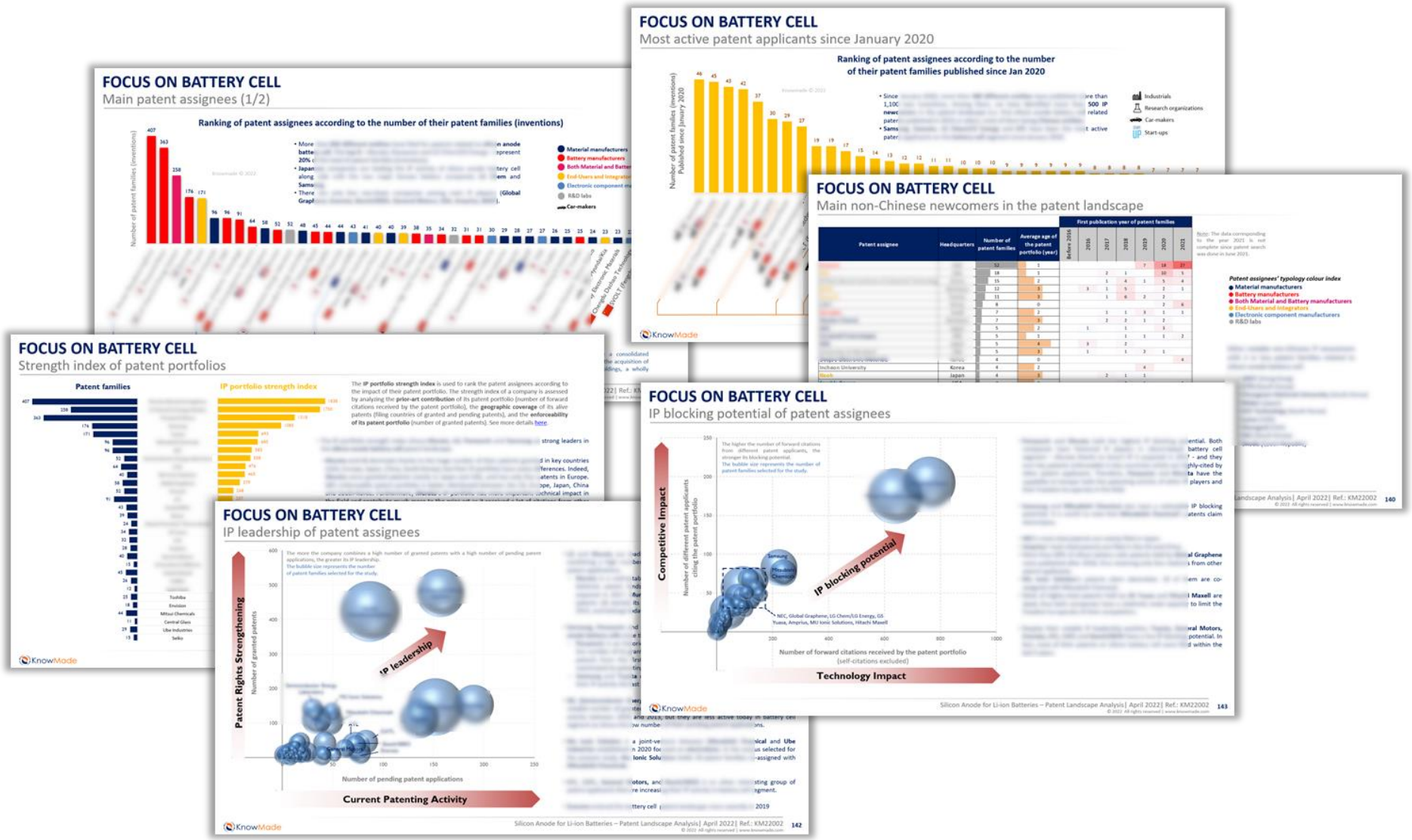
Key IP players, IP newcomers, key patents, recent IP development, etc.

SAMPLE



FOCUS ON BATTERY CELL

Key IP players, IP newcomers, key patents, recent IP development, etc.



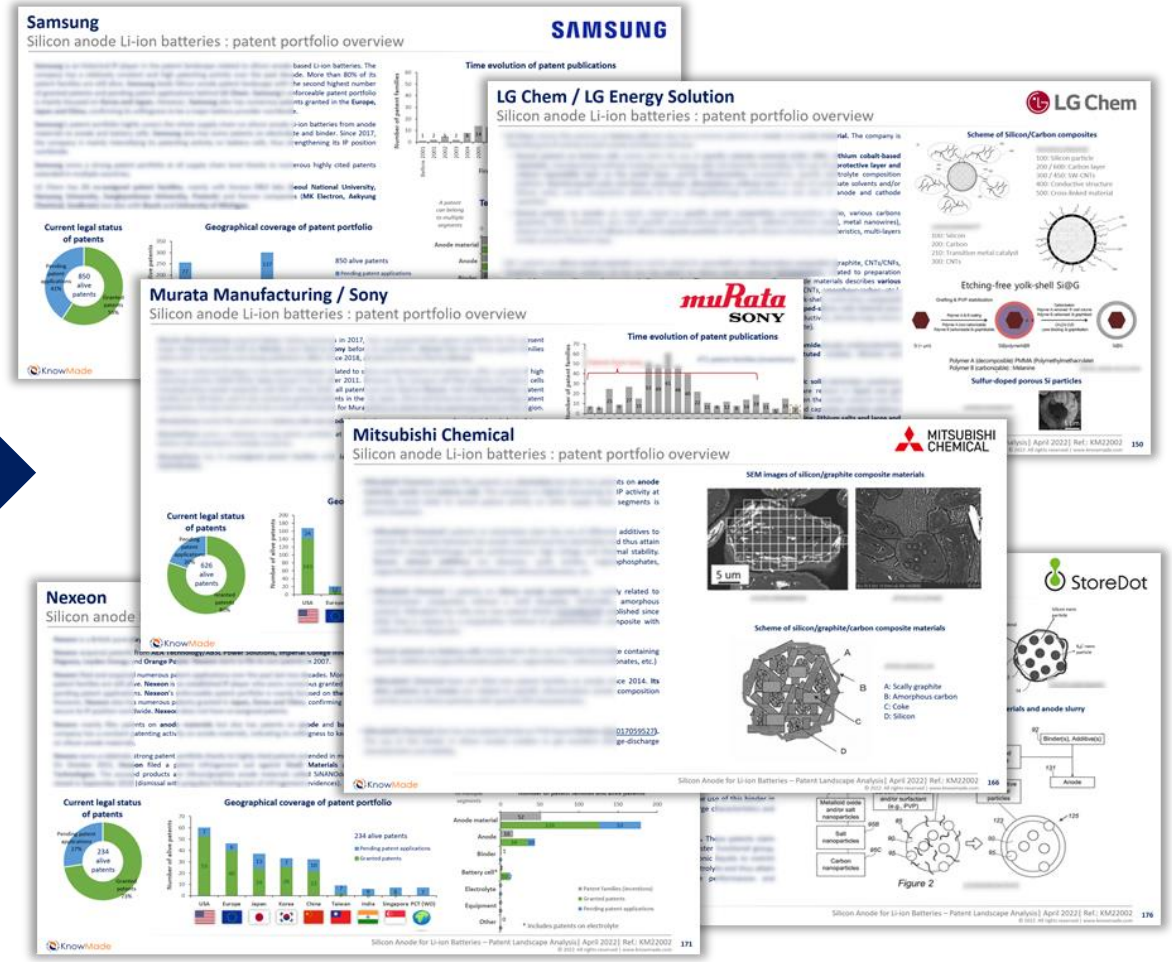
IP PROFILE OF KEY PLAYERS

IP portfolio summary, IP strategy, key patents and recent IP developments

A **focus on key IP players and newcomers** is provided in a dedicated section. For each patent assignee, the **silicon anode-based Li-ion battery patent portfolio** is statistically analyzed to provide an overview of its **strengths**, **weaknesses** and **level of IP activity**. Most **notable patents and recent IP developments** are described in light of the main silicon anode challenges.

SAMSUNG
LG Chem
Panasonic SANYO
muRata SONY
CATL
TOYOTA
SVOLT
SHOWA DENKO Hitachi Chemical
Shin-Etsu
MITSUBISHI CHEMICAL
BTR
nexeon
amprius
StoreDot
国轩高科 GUOXUAN HIGH-TECH
杉杉企业 Shanshan Corporation
GLOBAL GRAPHENE GROUP

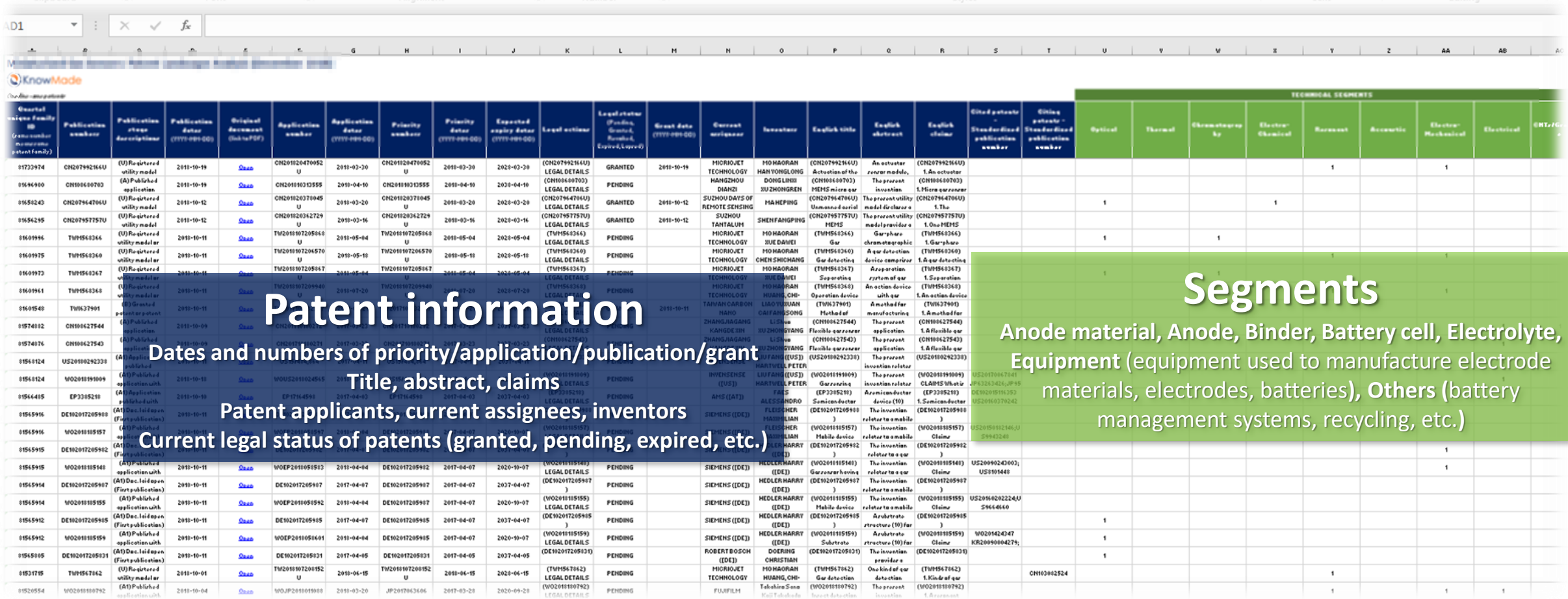
IP profile



PATENT DATABASE

Excel file containing all the patents analyzed in this report with corpus segmentation

The report also includes an **Excel database** with the 12,300+ patent families (inventions) analyzed in this study. This useful patent database allows **multi-criteria searches** and includes patent publication numbers, **hyperlinks to an updated online database** (original documents, legal status, etc.), priority dates, title, abstract, patent assignees, patent 's current legal status, and **segments** (anode material, anode, binder, battery cell, electrolyte, etc.).



Patent information

Dates and numbers of priority/application/publication/grant

Title, abstract, claims

Patent applicants, current assignees, inventors

Current legal status of patents (granted, pending, expired, etc.)

Segments

Anode material, Anode, Binder, Battery cell, Electrolyte, Equipment (equipment used to manufacture electrode materials, electrodes, batteries)**, Others** (battery management systems, recycling, etc.)

ORDER FORM

Silicon Anode for Li-ion Batteries

Patent Landscape Analysis – April 2022

Ref.: KM22002

SHIP TO
Name (Mr/Ms/Dr/Pr):
_____
Job Title:
_____
Company:
_____
Address:
_____
City:
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State:
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Postcode/Zip:
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Country:
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VAT ID Number for EU members:
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Email:
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Date:
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06560 Valbonne Sophia Antipolis
FRANCE

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IBAN: FR76 1460 7003 6360 6214 5695 139
BIC/SWIFT: CCBPFRPPMAR

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2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

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2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

2.4 The mailing is operated through electronic means either by email via the sales department. If the Product's electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to produce sufficient evidence of such defects.

2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed delivery. Any Product returned to the Seller without providing prior information to the Seller as required under article 2.5 shall remain at the Buyer's risk.

3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from time to time. The effective price is deemed to be the one applicable at the time of the order.

3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic transfer to the following account:

Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France
BIC or SWIFT code: CCBPFRPPMAR
IBAN: : FR76 1460 7003 6360 6214 5695 139

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

3.4 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

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4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller's website or the Products, or any information provided on the website, or in the Products;

b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.6 In the case where, after inspection, it is acknowledged that the Products contain defects, the Seller undertakes to replace the defective products as far as the supplies allow and without indemnities or compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for any event as set out in article 5 below.

4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its first down payment to the exclusion of any further damages.

4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot guarantee that any Product will be free from infection.

5. FORCE MAJEURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not the fault of the Seller.

6. PROTECTION OF THE SELLER'S IPR

6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

- Information storage and retrieval systems;
- Recordings and re-transmittals over any network (including any local area network);
- use in any timesharing, service bureau, bulletin board or similar arrangement or public display;
- Posting any Product to any other online service (including bulletin boards or the Internet);
- Licensing, leasing, selling, offering for sale or assigning the Product.

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial consequences in their entirety.

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will be the recipient of each new report in PDF format. This person shall also be responsible for respect of the copyrights and will guaranty that the Products are not disseminated out of the company.

7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be borne by the Seller, following this decision.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

8. MISCELLANEOUS

All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

Any notices under these Terms and Conditions shall be given in writing. They shall be effective upon receipt by the other Party.

The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have accepted the latest version of these terms and conditions, provided they have been communicated to him in due time.

9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse, which shall have exclusive jurisdiction upon such issues.

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.


KNOWMADE
Patent and Technology Intelligence

KNOWMADE PURPOSE

Turning **patents** and **scientific information** into **business-oriented report** for **decision makers** working in **R&D**, **Innovation Strategy**, **Intellectual Property**, and **Marketing**

Competitive landscape | Technology trends | Opportunities / Risks | R&D and IP strategy

KnowMade

Intellectual Property ⟷ **Innovation Strategy**

Patent your inventions

Assert your patents and defend your position in case of licensing/litigation

Evaluate the risks to infringe patents

Prior art search, Freedom-to-operate analysis, Patent invalidation, Evidence of use, Patent valuation

Understand, anticipate and evaluate the competitive landscape and current technology developments

Patent landscape, Monitoring service, IP due diligence

Improve your R&D and IP strategy

Identify and get access to external innovation

Technology scouting, Scientific literature analysis

KNOWMADE OFFER

Patent Landscape Analysis
to give an overview on IP dynamics, IP trends and IP players

Tailor-made analyses

Meet customer's business needs and budgetary constraints

Off-the-shelf Reports

Monitors

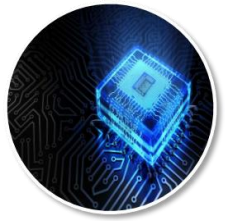
Patent Monitoring Service
to track current R&D activity and early detect weak signals, opportunities and risks

Monthly IP database | Quarterly report
Access to IP analysts

MAIN FIELDS OF EXPERTISE

Wireless and Optical Communications

- RF components & modules
- Antenna & Networks
- Photonics (datacom/telecom)



Advanced Packaging
Innovative Materials
AI & Computing

Energy Mgt & Storage

- Power electronics
- Batteries & Fuel-cells
- PV

Sensors and Optoelectronics

- MEMS
- Sensors & Imaging
- Lighting & Display

Life Sciences and Healthcare

- MedTech
- Microfluidics
- Biotech & Pharmaceutics
- Agrifood

BATTERY

Knowmade expertise

Whole Battery Supply Chain

- Materials
- Components
- Battery cell
- Battery Packs (BMS, thermal management, etc)
- Recycling
- Manufacturing

Key Battery Technologies

- Lithium battery
- Ni-MH battery
- Zn-Air battery
- Lead-Acid battery
- Na-S battery
- Redox flow battery
- Li-Air battery
- Li-S battery
- Na-ion battery
- Mg-ion battery

All Battery applications

- Automotive
- Consumer
- Stationary
- Medical

All Battery Cell Designs

- Cylindrical
- Prismatic
- Flexible
- Thin film / Microbattery

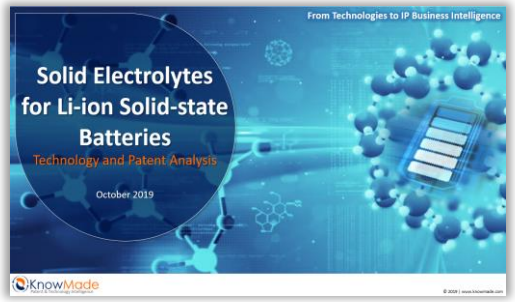
BATTERY
Products

SEPARATOR

ELECTROLYTES
Liquid, gelled, solid, ionic liquids, solvents, salts, additives, etc.

REPORT

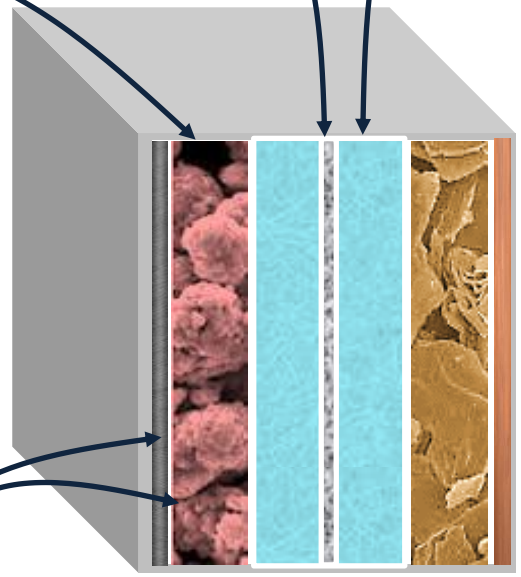
Solid Electrolytes for Li-ion Solid-State Batteries (2019)



CATHODE
NMC, NCA, LFP, LMO, etc.

REPORT

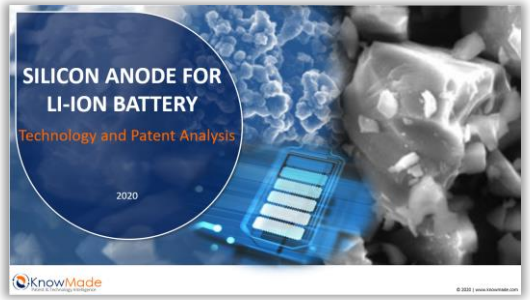
NMC Li-ion Battery (2017) Update (2022)



ANODE
Graphite, Silicon, LTO, Lithium, etc.

REPORT

Silicon Anode for Li-ion Battery (2022)



Other materials:
Current collector, binder, additives, etc.

Click on the picture to access to the flyer and sample

REPORT & MONITOR

Solid-State Li-ion Batteries (2021)

REPORT

Status of Battery Patents (2018)

Microbattery (2016)

BATTERY

Solid-State Batteries Patent Monitor (annual subscription)

CONTENTS

Quarterly IP database (up-to-date Excel file)

- New patent applications
- Patents newly granted
- Expired or abandoned patents
- Transfer of IP rights (re-assignment, licensing)
- Patent litigation & opposition
- Patent categorization by:
  - Supply Chain: Electrolyte, Electrode, Battery, Pack
  - Type of electrolyte materials: Inorganic, Inorganic/polymer, Polymer
  - Inorganic electrolyte materials: Sulfide Glass Ceramic, Thio-LISICON, Argyrodite, Oxide Glass Ceramic, NASICON, Garnet, Perovskite, Anti-Perovskite, LISICON, Hydride, etc.

Quarterly IP report (PDF slide deck)

On a quarterly basis, this report will provide the IP trends over the three last months, with a close look to key IP players and key patented technologies.

Access to an IP analysts (100 hours per year)

Q&A session and discussion with our IP analysts regarding trends, analyses, specific patented technologies or company's IP portfolio in the field of solid-state batteries.

Flyer and samples: www.knowmade.com/downloads/solid-state-batteries-patent-monitor/

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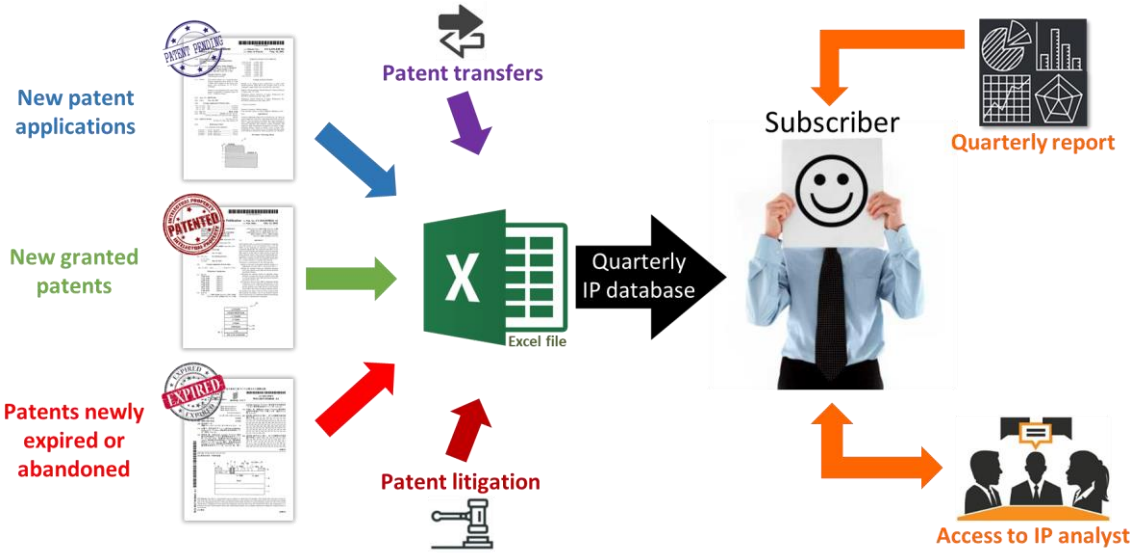
- ✓ Identify emerging research areas and **cutting-edge technology** developments
- ✓ Mitigate patent **infringement risks**
- ✓ Take advantage of **free technologies**



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