海普新能源锂电产业链解决方案

HAIPU New Energy Lithium Battery Industry Chain Solutions

海普深耕新能源锂电产业链，形成了覆盖“资源提取—关键电池材料纯化—锂电回收”全链条的提取纯化与循环利用解决方案。公司聚焦三大核心业务：

- **上游资源端**，海普通过高选择性吸附材料与离子膜的集成工艺，可直接从成分复杂的盐湖卤水或工业副产品原料中靶向提取锂，并能在同一体系中实现锂的浓缩与高纯转化，显著提升资源利用率和产品品质。同时，对硫酸镍、硫酸钴、硫酸锰等原料进行高效除杂，获得高纯度电池材料。
- **中游关键电池材料端**，在正极材料制备过程中，海普采用精准靶向的吸附分离技术，深度去除镍、钴、油类、TOC等杂质离子，有效提升前驱体及成品材料的纯度，保障电池核心材料的电化学性能与批次稳定性。此外，还可在电解液核心材料六氟磷酸锂的生产过程中进行深度除杂与资源回收。
- **下游循环端**，针对废旧电池正极材料拆解浸出液的复杂组分，海普结合多级吸附与电渗析等膜技术耦合工艺，选择性去除氟、铜、铁等杂质，并富集锂、钴、镍等有价元素，将其直接转化为可用于电池生产的电池级盐类，实现关键资源的绿色高效闭环再生。

Haipu has deeply cultivated the new energy lithium battery industry chain, forming a solution for extraction, purification, and recycling that covers the entire chain from "resource extraction to purification of key battery materials to lithium battery recycling". The company focuses on three core businesses:

On the upstream resource side, the integrated process of high selectivity adsorption materials and ion membranes in Haipu can directly extract lithium from complex salt lake brine or industrial by-product raw materials, and achieve lithium concentration and high-purity conversion in the same system, significantly improving resource utilization and product quality. At the same time, efficient impurity removal is carried out on raw materials such as nickel sulfate, cobalt sulfate, and manganese sulfate to obtain high-purity battery materials.

In the midstream of key battery materials, in the preparation process of positive electrode materials, Haipu adopts precise targeted adsorption separation technology to deeply remove impurity ions such as nickel, cobalt, oil, TOC, etc., effectively improving the purity of precursor and finished materials, and ensuring the electrochemical performance and batch stability of battery core materials. In addition, deep impurity removal and resource recovery can also be carried out in the production process of lithium hexafluorophosphate, the core material of the electrolyte.

At the downstream recycling stage, Haipu combines multi-stage adsorption and electrodialysis membrane technology to selectively remove impurities such as fluorine, copper, and iron, and enriches valuable elements such as lithium, cobalt, and nickel to directly convert them into battery grade salts that can be used for battery production, in order to achieve green and efficient closed-loop regeneration of key resources, targeting the complex components of the leachate from the dismantling of waste battery positive electrode materials.

01

锂资源提取与原材料纯化

Lithium resource extraction and raw material purification

盐湖提锂并回收铷、铯、硼等伴生资源

Extracting lithium from salt lakes and recovering associated resources such as rubidium, cesium, boron, etc

锂矿提锂及伴生资源回收

Lithium extraction from lithium ores and recovery of associated resources

油气田卤水提锂与纯化

Lithium extraction and purification from oil and gas field brine

地热卤水提锂与资源化

Extraction and purification of lithium from geothermal brine

粉煤灰资源化提锂

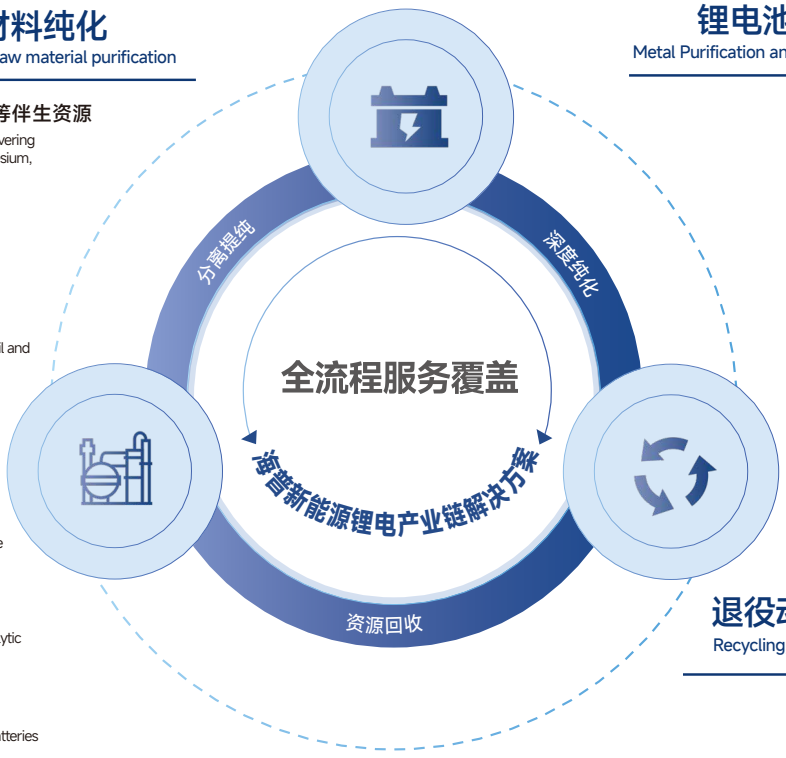
Extracting lithium from fly ash for resource recovery

电解铝废渣资源化提锂

Resource recovery of lithium from electrolytic aluminum waste residue

三元电池原材料纯化

Purification of raw materials for ternary batteries



02

锂电池行业金属纯化与资源循环

Metal Purification and Resource Recycling in Lithium Battery Industry

锂电池关键材料纯化与再利用循环

Purification and recycling of key materials for lithium batteries

钒液流电池关键材料纯化与再利用循环

Purification and recycling of key materials for vanadium redox flow batteries

固态电池关键材料纯化与再利用循环

Purification and recycling of key materials for solid-state batteries

废水资源化处理与利用

Wastewater Resource Utilization and Treatment

03

退役动力电池回收处理与再利用

Recycling, processing, and reuse of retired power batteries

电池浸出液资源化处理与利用

Resource recovery and utilization of battery leachate

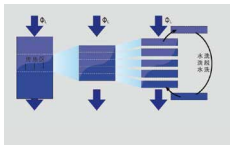
盐湖资源提取解决流程

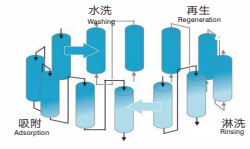
Extraction process of salt lake resources

①连续离交 Continuous ion exchange

连续离子交换技术是一种不同于传统工艺的、完全革新的分离工艺技术。此系统是由树脂柱系列和多孔分配旋转阀构成，根据工艺设计可把树脂柱系列分为几个功能区，物料进入系统后，通过旋转阀切换使每根树脂柱依次经过各个功能区实现同时吸附、水洗、解析、再生等全部工艺过程，从而把传统的间歇过程变成连续的过程。

Continuous ion exchange technology is a completely innovative separation process technology that differs from traditional processes.
This system consists of a resin column series and a porous distribution rotary valve. According to the process design, the resin column series can be divided into several functional zones. After the material enters the system, it is switched through the rotary valve so that each resin column passes through each functional zone in turn to achieve the entire process of simultaneous adsorption, water washing, desorption, regeneration, etc., thereby transforming the traditional batch process into a continuous process.





②电渗析、双极膜产品 Electrodialysis and bipolar membrane products

电渗析装置用膜核心为均相阴、阳离子膜，凭借活性基团静电作用实现离子选择性迁移，是电渗析装置脱盐、浓缩与分离的基础。

The core of the membrane used in electrodialysis devices consists of homogeneous anion and cation membranes, which achieve selective ion migration through electrostatic interactions of active groups. This forms the basis for desalination, concentration, and separation in electrodialysis devices.

双极膜是含阳、阴离子交换层及中间界面层的革命性复合膜，电场下可高效解离水分子为H^+和OH^-，兼具“酸碱发生器”功能。

The bipolar membrane is a revolutionary composite membrane comprising cation/anion exchange layers and an intermediate interface layer. It can efficiently dissociate water molecules into H^+ and OH^- under an electric field, functioning as both an "acid-base generator".

电渗析装置一般以阴阳离子交换膜交替排列形成脱盐/浓缩室，实现溶液分离提纯；集成双极膜装置则无需外加酸碱，可直接将盐溶液转化为对应酸碱，完成从“分离”到“物质转化”升级。两类膜及装置为盐湖提锂提供了制备电池级氢氧化锂、浓缩锂液除硼、制备酸碱等高效低碳方案。

Electrodialysis devices typically feature alternating anion and cation exchange membranes forming desalination/concentration chambers to achieve solution separation and purification. Integrated bipolar membrane devices, on the other hand, eliminate the need for external acid and alkali, enabling the direct conversion of salt solutions into corresponding acids and alkalis, thus achieving an upgrade from "separation" to "material transformation". These two types of membranes and devices provide efficient and low-carbon solutions for lithium extraction from salt lakes, such as the preparation of battery-grade lithium hydroxide, boron removal from concentrated lithium solutions, and the preparation of acids and alkalis.

③树脂除杂、除硼专项吸附剂及配套工艺 Electrodialysis and bipolar membrane products

在盐湖提锂的精制纯化阶段，离子交换树脂技术依托固定床吸附柱系统，可深度脱除钙、镁、硼等关键杂质。其中，螯合树脂凭借其特种官能团选择性吸附钙、镁离子，而硼吸附树脂则通过特定基团与硼酸分子发生特异性络合。两类树脂单元在预处理后串联使用，原料液流经时杂质被有效截留，从而得到纯化的锂液；树脂饱和后，经酸/碱再生剂洗脱即可恢复活性，实现循环使用。该工艺具有高选择性与高效去除能力，已成为制备电池级高纯锂盐的关键技术保障。

In the refining and purification stage of lithium extraction from salt lakes, ion exchange resin technology relies on a fixed bed adsorption column system to deeply remove key impurities such as calcium, magnesium, and boron. Among them, chelating resins selectively adsorb calcium and magnesium ions through their special functional groups, while boron adsorption resins undergo specific complexation with boric acid molecules through specific groups. After pretreatment, these two types of resin units are used in series, effectively trapping impurities as the raw material solution flows through, thus obtaining purified lithium solution. After the resin becomes saturated, it can be eluted with acid/alkali regenerant to restore its activity and achieve recycling. This process, with its high selectivity and efficient removal capability, has become a key technical guarantee for the preparation of high-purity lithium salts for battery applications.

***伴生资源回收:盐湖提锂项目愈发重视铷、铯、硼等伴生资源综合回收，海普亦可进行相关资源回收，提高整体经济效益。**

Associated resource recovery: The lithium extraction project in salt lakes increasingly emphasizes the comprehensive recovery of associated resources such as rubidium, cesium, and boron. Haipu can also carry out related resource recovery to improve overall economic benefits.

锂电池关键材料生产纯化解决方案

Solution for production and purification of key materials for lithium batteries

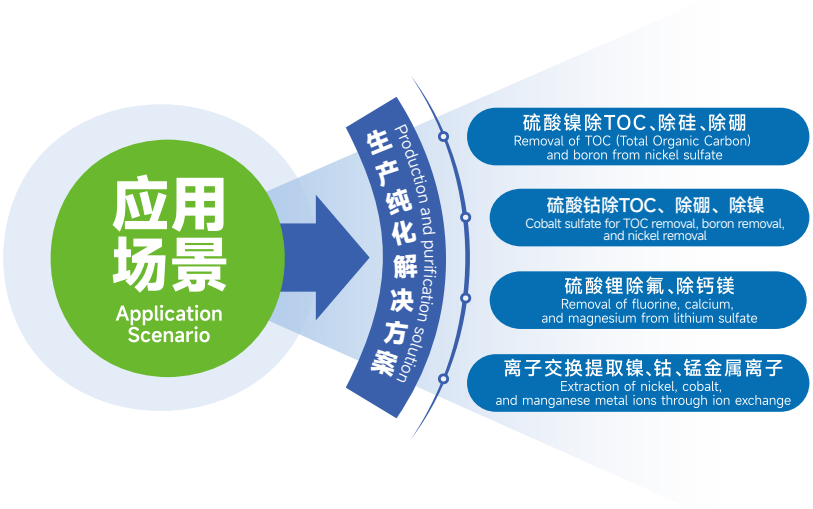
三元前驱体生产纯化技术
Production and purification technology of ternary precursor

在三元前驱体生产中，吸附剂与电渗析、双极膜装置主要用于保障原料液的高纯度和生产废水的资源化处理。

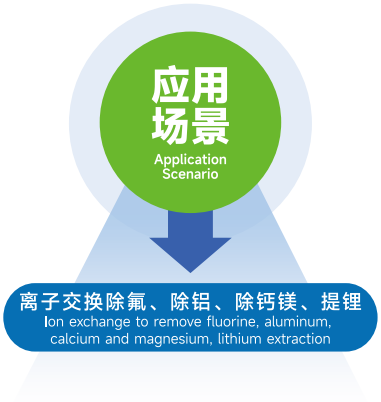
In the production of ternary precursors, adsorbents, electrodialysis, and bipolar membrane devices are primarily utilized to ensure the high purity of the raw material solution and to facilitate the resource recovery of production wastewater.

特种吸附剂或离子交换树脂可用于深度净化配制前驱体所需的硫酸镍、硫酸钴、硫酸锰等金属盐溶液，去除其中的微量钙、镁、铜等杂质离子，确保产品纯度。

Special adsorbents or ion exchange resins can be utilized for the advanced purification of metal salt solutions, including nickel sulfate, cobalt sulfate, and manganese sulfate, required for the preparation of precursors. These adsorbents or resins effectively remove trace impurity ions such as calcium, magnesium, and copper, thereby ensuring the purity of the product.



磷酸铁锂正极材料生产纯化技术
Production and purification technology of lithium iron phosphate cathode material



在磷酸铁锂正极材料的生产中，吸附剂与电渗析、双极膜装置的应用同样主要服务于生产系统的配套环节。特种吸附剂可用于原料（如磷酸、碳酸锂、铁源等）进料前的终端精制，深度去除痕量金属杂质，确保原材料纯度。同时，磷酸铁锂正极材料在生产过程中由于洗涤、冷却、废气处理等工序会产生大量的废水，其中含有磷酸盐等污染物，进入水体中将严重危害水体的生态环境，且含锂离子等需回收利用资源因此必须进行妥善处理。海普磷资源回收专用树脂产品可选择性回收磷酸盐。从而回用于前驱体合成、设备清洗等工序，解决环保和磷资源的回收问题，实现资源的内部循环与废水的近零排放。

In the production of lithium iron phosphate cathode materials, the application of adsorbents, electrodialysis, and bipolar membrane devices mainly serves the supporting links of the production system. Special adsorbents can be used for terminal refining of raw materials (such as phosphoric acid, lithium carbonate, iron sources, etc.) before feeding, to deeply remove trace metal impurities and ensure the purity of raw materials. At the same time, during the production process of lithium iron phosphate cathode materials, a large amount of wastewater is generated due to washing, cooling, exhaust gas treatment and other processes, which contain pollutants such as phosphates. When entering the water body, it will seriously harm the ecological environment of the water body, and resources containing lithium ions that need to be recycled and reused must be properly treated. Haipu phosphate resource recycling resin products can selectively recycle phosphate. Thus, it can be reused for precursor synthesis, equipment cleaning, and other processes, solving environmental protection and phosphorus resource recycling problems, achieving internal resource circulation and near zero discharge of wastewater.

电解液生产纯化和资源回收技术
Electrolyte production purification and resource recovery technology

制备电解液核心溶质六氟磷酸锂的过程中，树脂技术扮演着至关重要的"纯化与回收"角色:一方面，使用选择性吸附树脂从含锂母液中回收锂离子，实现原料的循环利用;另一方面，通过专用除氟树脂处理含氟废水，并利用特制纯化树脂在最终阶段吸附电解液中的痕量游离酸与金属杂质，从而在保障电池安全性与稳定性的同时，实现了从源头到末端的资源回收与深度纯化。

In the process of preparing the electrolyte core solute lithium hexafluorophosphate, resin technology plays a crucial role in "purification and recovery": on the one hand, selective adsorption resin is used to recover lithium ions from lithium containing mother liquor, achieving the recycling of raw materials; On the other hand, fluoride containing wastewater is treated with a specialized defluorination resin, and trace free acids and metal impurities in the electrolyte are adsorbed by a specially designed purification resin in the final stage. This ensures the safety and stability of the battery while achieving resource recovery and deep purification from the source to the end.

锂电资源回收解决方案

Lithium battery resource recycling solution

海普在锂电回收领域重点辅助企业解决磷酸铁锂和三元正极材料湿法回收的问题，通过特种除氟、磷、硅、硼、钙镁等吸附剂，对硫酸锂料液深度纯化，可制备高纯的硫酸锂产品，并经过浓缩沉淀制备碳酸锂，或通过双极膜制备氢氧化锂产品。此外，对于可能涉及萃取工艺的三元正极材料回收工段，海普可以提供零污染引入的专利除油技术，提高产品纯度。还可提供对于三元前驱体的原材料的特种除硅、氟、提镍和镍钴分离等树脂。

Haipu focuses on assisting enterprises in the field of lithium battery recycling to solve the problem of wet recovery of lithium iron phosphate and ternary positive electrode materials. Through special adsorbents such as fluorine removal, phosphorus removal, silicon removal, boron removal, calcium magnesium removal, etc., the lithium sulfate solution can be deeply purified to prepare high-purity lithium sulfate products, which can be concentrated and precipitated to prepare lithium carbonate or lithium hydroxide products through bipolar membranes.
In addition, for the recovery section of ternary positive electrode materials that may involve extraction processes, Haipu can provide patented oil removal technology introduced with zero pollution to improve product purity. We can also provide special resins for silicon removal, fluorine removal, nickel extraction, and nickel cobalt separation of raw materials for ternary precursors.

三元前驱体正极材料回收技术

Ternary precursor cathode material recycling technology

三元正极材料回收国内以湿法路径为主，经过多级分离除杂工序可高效回收利用金属离子制备三元前驱体，**海普在镍钴料液除油、除硼，沉锂母液锂钠分离等工序方面可提供专项定制产品。**

The recycling of ternary cathode materials in China primarily adopts a wet process. Through multistage separation and impurity removal procedures, metal ions can be efficiently recycled and utilized to prepare ternary precursors. Haipu can provide specialized customized products for processes such as oil and boron removal from nickel and cobalt material solutions, and lithium-sodium separation from lithium precipitation mother liquor.

在三元锂电池正极材料回收工艺流程中，**江苏海普自主研发的高性能特种吸附剂及自动化处理工艺在三元锂料液分离纯化多级萃取后除油同时降低TOC指标、制备电池级锂产品除杂以及沉锂母液回收碳酸锂方面有突出优势。**

In the recycling process of ternary lithium battery cathode materials, Jiangsu HAIPU's independently developed high-performance specialty adsorbents and automated processing technologies demonstrate significant advantages in oil and TOC removel from ternary lithium liquid after separation and purification and multistage extraction preparation of battery-grade lithium products, and lithium carbonate recovery from lithium precipitation mother liquor.

磷酸铁锂正极材料回收技术

Lithium iron phosphate cathode material recycling technology

海普助力磷酸铁锂正极材料高效回收，可提供硫酸锂选择性除氟、除钙镁、磷酸铁选择性除铝及双极膜制备氢氧化锂等解决方案，“吸附+膜”双核心技术可以穿插在各个工序之间，为客户制备电池级锂盐提供强力的技术保障。

Haipu facilitates the efficient recycling of lithium iron phosphate cathode materials and offers solutions such as selective fluoride removal from lithium sulfate, calcium and magnesium removal, selective aluminum removal from iron phosphate, and the preparation of lithium hydroxide using bipolar membranes. The "adsorption + membrane" dual-core technology can be integrated into various processes, providing strong technical support for customers in the preparation of battery-grade lithium salts.

海普助力磷酸铁锂正极材料高效回收，可提供硫酸锂选择性除氟、除钙镁、磷酸铁选择性除铝及双极膜制备氢氧化锂等解决方案，为客户制备电池级锂盐提供强力的技术保障。

HAIPU is committed to efficient recycling of LFP cathode materials by offering solutions such as selective removal of fluorine and calcium/-magnesium from lithium sulfate, selective removal of aluminum from iron phosphate, and lithium hydroxide production via bipolar membrane technology. These solutions provide strong technical support for customers in producing battery-grade lithium salts.

树脂吸附与离子膜技术产品应用场景

Product application scenarios

应用领域	产品功能	产品型号	典型应用场景
资源提取	提锂	HPL16X系列(铝系)	偏酸性至中性料液提锂； 高原/高寒地区盐湖开发及低温卤水提锂； 含锂电镀液、粉煤灰酸浸液等工业废水中回收锂资源。 适用于水耗要求严格的提锂场景。
		HPL91X系列(钛系)	偏碱性料液提锂，如碳酸盐卤水、沉锂母液、电池材料碱性废水等； 粉煤灰碱烧结或浸取提锂。
		HP180(锰系)	偏碱性料液提锂，尤其是低品位卤水。
	提铷铯	HPY408	盐湖卤水、锂云母等矿石提锂后的尾液提铷铯。
	提钴	HPC001	铜、镍等金属的浸出液或盐溶液分离并提纯钴； 废旧三元锂电池（含镍、钴、锰）浸出液回收钴。
	贵金属提取	HP4080	可实现金、银、铂、钯等贵金属的提取与分离， 如冶金行业、电镀及电子工业冲洗水、浸出液等中提取贵金属； 深度去除废水中低浓度的溶解性汞盐。
分离纯化	深度除大分子有机物/油	HP268	废酸脱色除有机物；高盐废水精制脱色； 净化锂电池湿法回收过程中的浸出液； 处理各类萃取工艺产生的含油废水，实现资源回收。
	除钙镁	HP4010	精制富锂液或粗制碳酸锂深加工、磷酸铁锂/三元正极材料拆解回收、电子工业等领域除钙镁； 金属酸洗、湿法冶金等工艺中除钙镁。
	深度除钙镁	HP705	碳酸氢锂、硫酸锂溶液制备高纯锂产品、三元锂电池回收得硫酸锂料液除钙镁。
	深度除重金属	HP706	电子、金属加工废水等工业废水达标排放或回用深度除重。
	除氟	HP3500	锂电回收液除氟、制备锂电池电解液过程中净化除氟； 锂矿石开采冶炼除氟、含锂铝渣提锂除氟、光伏水体除氟； 其他新能源关键材料纯化与资源回收。
	除硼	HPB119	氢氧化锂、碳酸氢锂等锂盐溶液纯化除硼； 湿法回收正极材料浸出液除硼； 精制镁盐除硼。
	除镍、铜	HP686	锂电正极材料生产与电池回收中回收镍、铜及纯化料液； 钴电解液深度除镍、铜； 镍电解阳极液选择性除铜。
	除硅	HP4900	湿法回收工艺中硫酸镍溶液除硅； 煤化工、湿法冶金、半导体等各行业溶液中除硅。
	除砷、锑	HP560	半导体生产、冶金等行业含砷、含锑废水净化处理。
	除铝	HP606	锂电湿法回收中的铝离子资源化回收。
	除磷	HP5600	回收磷酸铁锂时浸出液深度除磷回用。
离子交换膜	均相膜	HP-AM-100	浓缩型，高浓缩倍数，硝酸盐，碱浓缩。
		HP-AM-200	脱盐-I型，氯盐，高有机物截留。
		HP-AM-300	脱盐-II型，硫酸盐、磷酸盐体系。
		HP-AM-400	耐酸碱型，双极膜配套阴膜，酸浓缩。
		HP-CM-100	浓缩型，高浓缩倍数，含锂溶液（氯化锂、硫酸锂）、酸浓缩。
		HP-CM-200	脱盐型，通用膜,适合多数盐（氯化钠、硫酸钠、硝酸钠）。
		HP-CM-300	耐酸碱型，双极膜配套阳膜，碱性盐。
	双极膜	BPM-100	标准型，适用于一般酸碱生成和分离。
		BPM-200	高性能型，具有更高的电流效率和更长的使用寿命。
		BPM-300	定制型，可根据客户需求调整膜厚度和尺寸产品型号。
其他			可根据具体产品需求定向开发专用纯化分离树脂与离子膜。

应用案例
Application case

西藏盐湖提锂项目（钛系吸附剂）
Tibet Salt Lake Lithium Extraction Project

西藏某矿业拉果错盐湖年产2万吨氢氧化锂项目，海拔4600米,利用海普盐湖提锂钛系吸附剂，从盐湖原卤中高效率提取锂离子。卤水锂浓度~0.22g/L，钠浓度约20g/L，碳酸根浓度约3g/L，卤水PH约9.2。我司提供1500m³钛系吸附剂，合格液锂浓度在1400mg/L以上，锂钠比＞2:1、锂镁比＞3，锂收率80%以上。海普钛系提锂产品吸附速率快，选择性高，运行稳定，提取过程绿色无污染，保护盐湖周边生态。本项目是钛系吸附剂首次运用于大规模生产。

A mining industry in Tibet, Lago Co Salt Lake annual output of 20,000 tons of lithium hydroxide project, altitude of 4600 meters, the use of Haipu salt lake lithium titanium adsorbent, from the salt lake brine extraction of lithium ions in high efficiency. The brine lithium concentration ~ 0.22g / L, sodium concentration of about 20g / L, carbonate concentration of about 3g / L, brine PH about 9.2. We provide 1500m ³ titanium adsorbent, qualified liquid lithium concentration of more than 1400mg / L, lithium-sodium ratio> 2:1, lithium-magnesium ratio> 3, lithium yield of more than 80%. Haipu titanium lithium extraction products have fast adsorption rate, high selectivity, stable operation, green and pollution-free extraction process, and protect the ecology around the salt lake. This project is the first time that titanium adsorbent is used in large-scale production.

青海某盐湖吸附提锂项目
Lithium adsorption and extraction project in a salt lake in Qinghai Province

2023年12月至今，海普对该项目进行了中试验证与规模化生产，铝系吸附剂产品在吸附容量、交换速率和选择性等核心性能上表现优异，锂离子回收率可达99%以上，产出脱附液中锂钠比/锂镁比均在4以上。
系统运行期间未出现性能衰减趋势，成功验证海普铝系吸附剂对硫酸根等干扰离子的长期耐受能力，标志着原卤直接提锂技术长期稳定运行的关键瓶颈获得实质性突破。

Since December 2023, Haipu has conducted pilot tests and large-scale production of the project. The aluminum based adsorbent products have shown excellent performance in core properties such as adsorption capacity, exchange rate, and selectivity. The lithium ion recovery rate can reach over 99%, and the lithium sodium ratio/lithium magnesium ratio in the output desorption solution is above 4.
During the operation of the system, there was no performance degradation trend, successfully verifying the long-term tolerance of Haipu aluminum based adsorbents to interfering ions such as sulfate ions. This marks a substantial breakthrough in the key bottleneck of the long-term stable operation of lithium extraction technology directly from brine.

安徽新能源料液除氟项目
Anhui New Energy Fluoride Removal Project

客户锂电回收硫酸锂料液氟离子≤250mg/L，杂质高，无法满足电池级碳酸锂要求。采用海普除氟吸附剂，出水氟≤1mg/L，无锂损失，未引入杂质，提升料液品质。系统自动化运行，费用低，节省成本。

The customer's lithium battery recycling lithium sulfate material liquid has fluoride ≤ 250mg/L, high impurity, can not meet the requirements of battery-grade lithium carbonate. Adopting Haipu fluoride removing adsorbent, the fluorine in the effluent water can be reduced to ≤1mg/L, with no lithium loss and no impurity introduced, which improves the quality of the feed solution. System is automated with low cost.

江西省新能源硫酸铵料液除镍钴项目
Nickel and Cobalt Removal from Ammonium Sulfate Solution in a New Energy Project in Jiangxi Province

江西某公司硫酸铵原液80m³/h，含镍钴约400mg/L，采用海普HP4010吸附剂处理，镍钴降至2mg/L以下，脱附液富集资源回收，除重后硫酸铵进入MVR系统产出高纯结晶。

Ammonium sulfate raw liquid with flow rate of 80m3/h from a company in Jiangxi province, containing nickel and cobalt about 400mg/L. After treatment by using Haipu HP4010 adsorbent, nickel and cobalt was reduced to less than 2mg/L. And then the enrichment resources of the desorption solution were recovered and the heavy metal was removed, and ammonium sulfate entered the MVR system to produce high purity crystals.

浙江新能源料液除TOC项目
TOC Removal from Feed Solution in a New Energy Project in Zhejiang

浙江衢州某锂电企业硫酸钴料液因残留萃取剂和磺化煤油导致TOC达120mg/L，影响前驱体合成。采用HP268吸附工艺结合蒸汽吹脱再生技术，每天处理70m³料液，TOC从120mg/L降至40mg/L。工艺稳定，材料可循环利用，且不引入新杂质。

Cobalt sulfate feed solution of a lithium enterprise in Quzhou, Zhejiang Province, has a TOC of 120mg/L due to residual extractant and sulfonated kerosene, which affects the synthesis of precursor. By using HP268 adsorption process combined with steam blowing regeneration technology, 70m³ of material liquid is treated every day, and the TOC is reduced from 120mg/L to 40mg/L. The process is stable, the material can be recycled, and no new impurities are introduced.

浙江新能源料液除硼项目
Zhejiang New Energy Boron Removal Project

客户的硫酸钴、镍料液硼含量＞2mg/L，无法满足外售要求。采用树脂吸附除硼，硼从10mg/L降至＜2mg/L，硫酸脱附不引入杂质，选择性吸附硼，确保钴镍无损失，提升料液纯度。

The boron content of the customer's cobalt and nickel sulfate feed solution is >2mg/L, which can't meet the requirements for sale. Adopting resin adsorption to remove boron, boron is reduced from 10mg/L to <2mg/L, sulfuric acid desorption does not introduce impurities, selective adsorption of boron ensures no loss of cobalt and nickel, and improves the purity of the feed solution.

广东新能源除铝项目
Guangdong New Energy Aluminum Removal Project

客户在锂电回收磷酸铁料液含偏高的Al离子200~300mg/L，无法回用。采用海普除铝吸附剂，出水Al≤50mg/L，未引入杂质，提升料液品质。系统自动化运行，工艺简单，运行稳定。

The customer's lithium battery recycling iron phosphate material liquid contains high Al ion 200~300mg/L, which cannot be reused. Adopting Haipu Aluminum removal adsorbent, the effluent Al≤50mg/L, without introducing impurities, to improve the quality of material liquid. The system is automated, with simple process and stable operation.

安徽新能源料液纯化除镍项目
Anhui New Energy Material Purification and Nickel Removal Project

安徽某企业锂电池回收硫酸铵溶液含镍钴锰，采用HP4040吸附工艺，将镍钴锰分别从＜10mg/L、＜10mg/L、＜50mg/L降至＜1mg/L，硫酸铵溶液回用。HP4020树脂选择性高，吸附量大，再生周期长，运行成本低，实现资源循环利用。

Ammonium sulfate solution from lithium battery recycling of an enterprise in Auhui province, contains nickel, cobalt and manganese. By using HP4040 adsorption process, the nickel, cobalt and manganese were reduced from <10mg/L, 10mg/L and <50mg/L to <1mg/L and ammonium sulfate solution can be reused. HP4020 has high selectivity, adsorption capacity and regeneration cycle, also low operating cost, which can achieve the efficient recycling of resources.

浙江新能源料液除硅项目
Zhejiang New Energy Silica Removal Project

新能源企业生产高品质硫酸镍料液需除杂降硅，采用HP4800吸附工艺，将硅含量从~30mg/L降至~7mg/L，提升料液纯度和产品竞争力。工艺选择性高，共存阴离子干扰小，自动化程度高，操作简便，占地面积小。

New energy enterprises need to remove impurities and reduce silicon in the production of high-quality nickel sulfate feed solution, using HP4800 adsorption process to reduce the silicon content from ~30mg/L to ~7mg/L, to enhance the purity of the feed solution and product competitiveness. The process has high selectivity, low interference of coexisting anions, high automation, easy operation and small footprint.

福建新能源有限公司
脱酸扩散电渗析及电渗析系统采购项目
Fujian Youli New Energy Co., Ltd. Deacidification Diffusion Electrodialysis and Electrodialysis System Procurement Project

福建某电池回收企业湿法车间磷铁浸出液，其中硫酸浓度15~20%，采用自主研发的扩散渗析装置，可回收80%的硫酸，回收酸浓度高，铁离子截留率达90%以上，回收酸品质高，可直接回用于前端浸出工艺。本设计工艺运行费用低，节省大量酸浸试剂，经济效益显著。

A Fujian battery recycling enterprise uses self-developed diffusion dialysis equipment to treat ferrophosphorus leachate (15-20% H_2SO_4) from its wet process workshop. This recovers 80% of the sulfuric acid as a high-concentration, high-quality product (with over 90% iron ion rejection) for direct reuse in front-end leaching. The process reduces operating costs and acid reagent consumption, delivering significant economic benefits.

津巴布韦硫酸锂建设项目
离子交换树脂柱除钙镁系统
Zimbabwe Huajing Technology Co., Ltd. Lithium Sulfate Project Ion Exchange Resin Column System for Calcium and Magnesium Removal

浙江某企业100m³/h硫酸锂料液除钙镁系统，项目地在非洲津巴布韦，采用自主研发的高性能特种吸附剂，对该料液进行吸附纯化处理，出料钙镁离子含量均<1mg/L，实现客户料液纯化的需求，保证后续生产碳酸锂产品的品质。

A Zhejiang-based enterprise, supporting a 50,000-ton annual lithium sulfate project, supplied a complete set of ion exchange resin column equipment for calcium and magnesium removal. The project is located in Harare, Zimbabwe. The project involves treating 100m³/h of lithium sulfate feed solution to remove calcium and magnesium impurities. By using high-performance specialty adsorbents independently developed by Haipu, the feed solution undergoes adsorption and purification, achieving calcium and magnesium ion contents in the output material of less than 1mg/L each. This meets the customer's requirement for feed solution purification and ensures the quality of subsequent lithium carbonate production.