



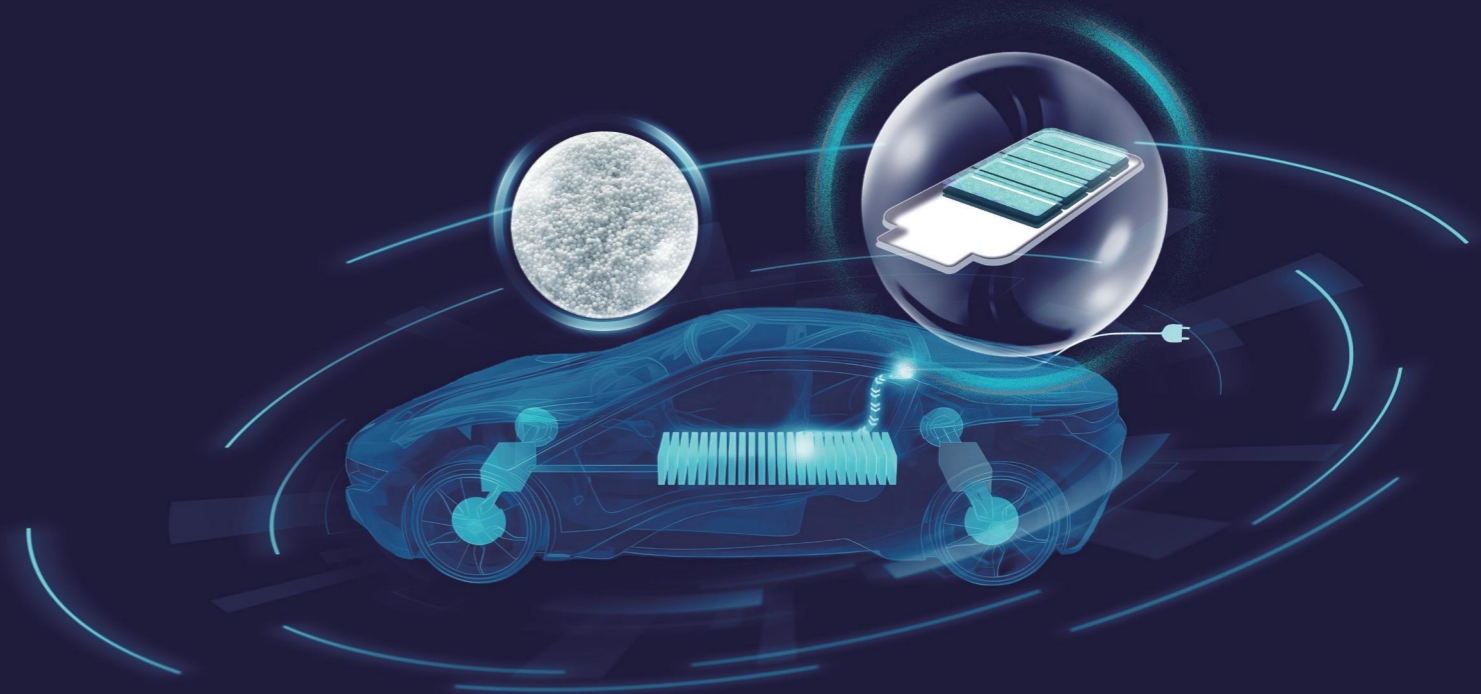
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新能源锂电产业链 资源提取纯化与循环再生

NEW ENERGY LITHIUM BATTERY INDUSTRY CHAIN
RESOURCE EXTRACTION PURIFICATION AND RECYCLING REGENERATION



江苏海普功能材料有限公司
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江苏海普功能材料有限公司
JIANGSU HAIPU FUNCTIONAL MATERIALS CO.,LTD.

关于海普

About HAIPU

江苏海普功能材料有限公司是一家专注为能源金属、核工业、资源环保、医药健康等领域提供分离纯化相关新材料及智能装备的国家高新技术企业。凭借深厚的技术积累和强大的创新能力，公司掌握多项关键核心技术，为金属提取与循环、核工业绿色发展、湿法冶金、资源环保、天然产物提取、药物分离纯化等场景推出了一系列具有自主知识产权的产品和解决方案，满足不同客户群体的多元需求。

海普秉承“以材料创新驱动新质生产力”的初心，从源头和底层创新解决技术难题，并紧贴市场需求、密切服务客户、持续优化升级，助力客户控本提质增效。

Jiangsu Haipu Functional Materials Co., Ltd. is a national high-tech enterprise that provides separation and purification related new materials and intelligent equipment for energy metals, nuclear industry, resources and environmental protection, medical health and other fields. With deep technical accumulation and strong innovation capabilities, the company has mastered many key core technologies and launched a series of products and solutions with independent intellectual property rights for metal extraction and recycling, green development of the nuclear industry, hydrometallurgy, resources and environmental protection, natural product extraction, drug separation and purification and other scenarios to meet the diverse needs of different customer groups.

Haipu adheres to the original intention of "driving new quality productivity with material innovation", solves technical problems from the source and bottom innovation, and closely follows market demand, closely serves customers, continuously optimizes and upgrades, and helps customers control costs, improve quality and efficiency.

70%

本部研发人员
占比超过70%

65%

硕士及以上学历
超过65%

100+

国内外核心专利
100余项

以材料创新驱动新质生产力

研发和产能

R&D and production capacity

公司核心团队由曾供职于美国陶氏化学、美国通用电气、南京大学、苏州大学等知名企业院校的博士、硕士组成，海普始终重视技术研发，坚持以材料创新驱动新质生产力，部分新型吸附材料打破国外技术垄断，填补国内空白，在相关技术领域达到行业领先水平。

Core team of Haipu is composed of members who have doctor and master degrees, and have worked for well-known companies and institutions including Dow Chemical, GE, Nanjing University, and Soochow University. Haipu has always put great importance on technology research and development and insisted on driving new quality productivity with material innovation. Some new adsorption materials break the monopoly of foreign technology, fill the domestic gap, and reach the industry-leading level in related technical fields.

海普全资子公司安徽博普纳米新材料有限公司，拥有36000吨特种吸附材料生产线；全资子公司安徽博昶智能设备有限公司，拥有年产200+套智能吸附系统及近100万平米特种离子膜装备产能。

Anhui Bopu Nano New Materials Co., Ltd., a wholly-owned subsidiary of Haipu, has a special adsorption material production line with a production capacity of 3,6000 tons. Anhui Bochang Intelligent Equipment Co., Ltd., another wholly-owned subsidiary of Haipu, has an annual production capacity of 200+ sets of intelligent adsorption systems and nearly 100 m² special ion membrane equipment.



企业荣誉

Company honor



合作伙伴

Business partner



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、镍等有价值元素，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

钠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

废水资源化利用与处理

Wastewater Resource Utilization and Treatment

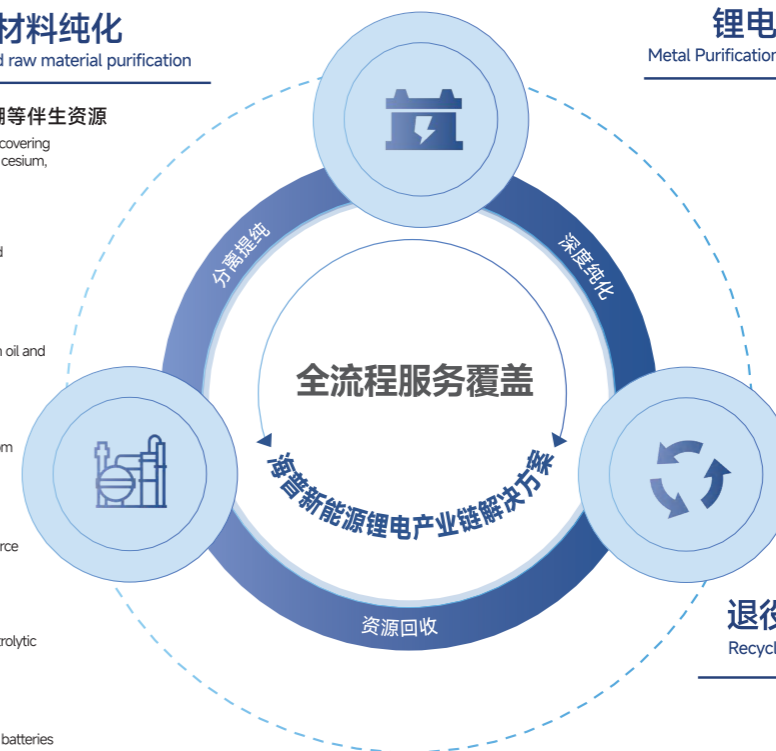
03

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

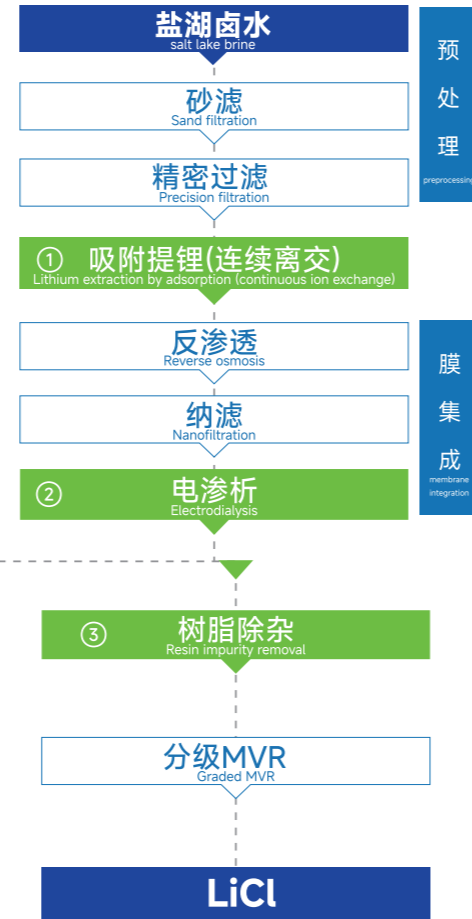
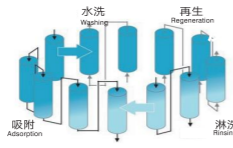
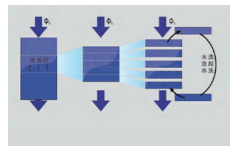
Extraction process of salt lake resources

①连续离子交换 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.



③ 树脂除钙镁 Resin removal of calcium and magnesium

③ 树脂除硼 Boron removal by resin

③ 树脂除杂 Resin impurity removal

② 双极膜 bipolar membrane

③ 树脂除钙镁 Resin removal of calcium and magnesium

③ 树脂除杂 Resin impurity removal

③ 树脂除钙镁 Resin removal of calcium and magnesium

③ 树脂除钙镁 Resin removal of calcium and magnesium

③ 树脂除钙镁 Resin removal of calcium and magnesium

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③ 树脂除钙镁 Resin removal of calcium and magnesium

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.

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

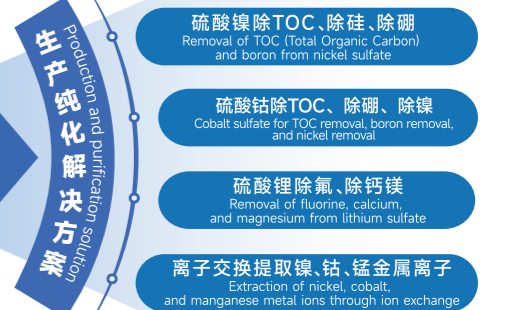
在三元前驱体生产中，吸附剂与电渗析、双极膜装置主要用于保障原料液的高纯度和生产废水的资源化处理。

In the production of ternary precursors, adsorbents, electro-dialysis, 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.

应用场景
Application Scenario



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, electro-dialysis, 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 removal 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有力的技术保障。

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.

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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.



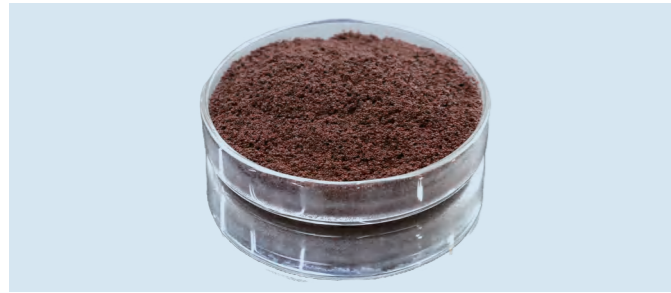
树脂吸附与离子膜技术产品应用场景

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。	
	提锂铯	HPY408	盐湖卤水、锂云母等矿石提锂后的尾液提铯。
	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。
	双极膜	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）。
	双极膜	HP-CM-300	耐酸碱型，双极膜配套阳膜，碱性盐。
		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。		

除油/除TOC树脂-HP268

Oil/TOC Removal Resin - HP268



产品优点

Advantages

- **高效吸附性能:** 具有优良的孔结构、较高的比表面积和孔容, 吸附容量大, 吸附速率快。
- **High-efficiency adsorption:** Features well-developed pore structure, elevated specific surface area, and pore volume for superior adsorption capacity with rapid kinetics.
- **优异的化学稳定性:** 耐酸、耐碱、耐各类溶剂, 适应复杂工况环境。
- **Outstanding chemical stability:** Maintains structural integrity under extreme acidic, alkaline, and solvent-rich environments, adaptable to complex industrial conditions.
- **易再生:** 可多次再生使用, 操作简单, 降低运行成本。
- **Regeneration capability:** Allows multiple regeneration cycles through simple operational protocols, effectively reducing operational costs.
- **使用寿命长:** 机械强度高, 稳定性好, 延长了吸附剂的使用寿命。
- **Extended service life:** Exhibits high mechanical strength and operational stability, ensuring prolonged service duration in continuous applications.

应用场景

Application Scenarios

- 新能源行业料液除有机物
- Organic impurity (Removal of Organic Matter from Process Liquids in the New Energy Industry (e.g., lithium battery recycling))
- 工业生产废水除有机物
- Organic contaminant removal from industrial wastewater
- 废酸脱色除有机物
- Waste acid decolorization to removal organic matter

除砷、磷、锑树脂-HP560

Arsenic, Phosphorus, and Antimony Removal Resin - HP560

产品优点

Advantages

- **高效吸附性能:** 具有优良的孔结构、较高的比表面积和孔容, 吸附容量大, 吸附速率快。
- **High Adsorption Performance:** Features an excellent pore structure, high specific surface area, and large pore volume, resulting in significant adsorption capacity and rapid adsorption rates.
- **高选择性:** 对砷、磷、锑离子具有优异的吸附选择性, 适合深度去除和达标处理。
- **High Selectivity:** Exhibits superior adsorption selectivity for arsenic, phosphorus, and antimony ions, making it suitable for deep removal and compliance treatment.
- **易再生:** 可多次再生使用, 操作简单, 降低运行成本。
- **Easy to Regenerate:** Can be regenerated multiple times with simple operations, effectively reducing operational costs.
- **使用寿命长:** 机械强度高, 稳定性好, 延长了吸附剂的使用寿命。
- **Long Service Life:** High mechanical strength and stability extend the lifespan of the adsorbent, minimizing replacement frequency.
- **适应性强:** 用于多种复杂水质环境, 确保稳定高效的去除效果。
- **Strong Adaptability:** Suitable for various complex water quality environments, ensuring stable and efficient removal performance.

应用场景

Application Scenarios

- 饮用水处理。
- Drinking water treatment.
- 冶金行业含砷、含磷、含锑废水净化处理。
- Purification of arsenic-, phosphorus-, and antimony-containing wastewater in the metallurgical industry.



除氟吸附剂-HP3500

Fluoride Removal Adsorbent - HP3500



产品优点

Advantages

- **吸附选择性和精度高:** 对氟离子的吸附选择性高, 其他共存阴离子干扰小, 吸附后出水氟离子浓度可低于1mg/L, 甚至可根据特殊要求降至0.2mg/L以下。
- **High Selectivity and Precision:** Exhibits high selectivity for fluoride ions with minimal interference from coexisting anions. After adsorption, the fluoride ion concentration in the effluent can be reduced to below 1 mg/L, and even to below 0.2 mg/L under special requirements.
- **优良的孔结构和比表面积:** 具有优良的孔结构、较高的比表面积和孔容, 水力扩散性能好, 交换容量大。
- **Excellent Pore Structure and Specific Surface Area:** Features an outstanding pore structure, high specific surface area, and large pore volume, ensuring good hydraulic diffusion performance and high exchange capacity.
- **处理效果好:** 出水稳定, 运行费用低, 吸附速率快, 活性高。
- **Superior Treatment Performance:** Provides stable effluent quality, low operating costs, fast adsorption rates, and high activity.
- **无杂质引入:** 不引入Al³⁺离子杂质, 确保吸附剂的纯净性。
- **No Impurity Introduction:** Does not introduce Al³⁺ ion impurities, ensuring the purity of the adsorbent.
- **机械强度高、稳定性好:** 吸附剂具有较高的机械强度和良好的稳定性。
- **High Mechanical Strength and Stability:** The adsorbent has high mechanical strength and excellent stability.

应用场景

Application Scenarios

- 锂电回收料液除氟; 地下水除氟; 饮用水除氟; 各种工业生产料液除氟; 表面处理行业含氟废水处理。
- Fluoride removal from lithium battery recycling feed solutions; Fluoride removal from Groundwater; Fluoride removal from Drinking water; Fluoride removal from various industrial production solutions; Fluoride treatment in wastewater from surface treatment industries

除硼树脂-HPB119

Boron Removal Resin - HPB119



产品优点

Advantages

- **高交换容量:** 树脂交换容量大, 处理效率高。
- **High Exchange Capacity:** The resin has a large exchange capacity, ensuring high treatment efficiency.
- **选择性去除:** 树脂中的配位基团与硼离子形成极其稳定的配合物, 对其他阴离子表现出惰性, 实现硼离子的高选择性去除。
- **Selective Removal:** The coordination groups in the resin form extremely stable complexes with boron ions and exhibit inertness to other anions, enabling highly selective removal of boron ions.
- **脱附工艺简单:** 脱附工艺易操作, 且不限定酸的种类, 有效规避引入限制离子。
- **Simple Elution Process:** The elution process is easy to operate and not restricted by the type of acid used, effectively avoiding the introduction of limiting ions.
- **易再生:** 树脂再生简单, 运行成本低。
- **Easy to Regenerate:** The resin is simple to regenerate, reducing operational costs.
- **使用寿命长:** 树脂稳定性高, 使用寿命长。
- **Long Service Life:** High stability ensures a long service life of the resin.



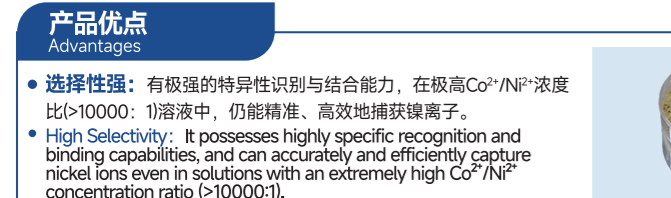
应用场景

Application Scenarios

- 氢氧化锂、碳酸氢锂等锂盐溶液纯化;
- Purification of lithium salt solutions such as lithium hydroxide and lithium bicarbonate.
- 制备不含硼的镁盐溶液: 12%的氯化镁中一般含100mg/L左右的硼, 通过树脂处理将硼量降低到10mg/L以下, 以生产出优良的镁;
- Preparation of boron-free magnesium salt solutions: Typically, 12% magnesium chloride contains about 100 mg/L of boron. Using the resin reduces boron content to below 10 mg/L, producing high-quality magnesium.
- 盐湖卤水、饮用水、灌溉用水等含硼水或料液中硼的去除;
- Removal of boron from brine, drinking water, irrigation water, or other boron-containing water or feed solutions.
- 海水淡化脱硼;
- Desalination of seawater for boron removal.
- 核反应堆硼含量调节;
- Adjustment of boron content in nuclear reactors.
- 硫酸锂、氯化锂、镍钴锰料液除硼。
- Boron removal from lithium sulfate, lithium chloride, and nickel-cobalt-manganese feed solutions.

除镍吸附剂-HP686

Nickel removal adsorbent - HP686



产品优点

Advantages

- **选择性强:** 有极强的特异性识别与结合能力, 在极高Co²⁺/Ni²⁺浓度比(>10000:1)溶液中, 仍能精准、高效地捕获镍离子。
- **High Selectivity:** It possesses highly specific recognition and binding capabilities, and can accurately and efficiently capture nickel ions even in solutions with an extremely high Co²⁺/Ni²⁺ concentration ratio (>10000:1).
- **高吸附容量与稳定性:** 在强酸性硫酸钴溶液中保持优异的化学与机械稳定性, 吸附容量大, 寿命长。
- **High Adsorption Capacity and Stability:** It maintains excellent chemical and mechanical stability in strongly acidic cobalt sulfate solutions, with a high adsorption capacity and a long service life.
- **钴损失率低:** 吸附材料对钴离子的吸附率 < 0.5%, 钴回收率可稳定在99.5%以上, 大幅降低原材料损耗。
- **Low Cobalt Loss:** The adsorption rate of the adsorbent material for cobalt ions is less than 0.5%, and the cobalt recovery rate can be stably maintained above 99.5%, greatly reducing raw material loss.
- **绿色环保:** 无需使用有机溶剂, 洗脱液可循环利用, 废水排放量减少80%以上。
- **Environmentally Friendly:** It eliminates the need for organic solvents, allows the eluent to be recycled, and reduces wastewater discharge by more than 80%.

应用场景

Application Scenarios

- 可用于锂电正极材料、锂电回收等生产过程中回收镍、铜, 料液纯化;
- Recovery of nickel and copper, as well as purification of process solutions, in the production of lithium battery cathode materials and lithium battery recycling.
- 可在酸性条件下, 吸附镍、铜离子;
- Adsorption of nickel and copper ions under highly acidic conditions.
- 钴电解液中去除镍离子, 纯化电解液;
- Removal of nickel ions from cobalt electrolyte solutions to purify electrolytes.
- 可在EDTA等强络合剂料液中选择性吸附镍、铜等重金属离子。
- Selective adsorption of heavy metal ions such as nickel and copper in solutions containing strong complexing agents (e.g., EDTA).

除磷树脂-HP5600

Phosphorus Removal Resin - HP5600



应用场景

Application Scenarios

- 浸出液除磷; 地下水、饮用水除磷; 湿法冶金行业、工业废水除磷; 各种工业生产料液除磷纯化。
- Leachate phosphorus removal; Phosphorus removal from groundwater and drinking water; Wet metallurgy industry and industrial wastewater phosphorus removal; Phosphorus removal and purification of various industrial production fluids.
- 生化废水提标。
- Biochemical effluent upgrading.

产品优点

Advantages

- **优异的结构性能:** 纳米孔道丰富, 水力扩散性能优异, 确保高效除磷。
- **Excellent Structural Performance:** Rich in nanoscale pore channels with superior hydraulic diffusion properties, ensuring highly efficient phosphorus removal.
- **高效吸附性能:** 对磷酸根离子吸附速率快、活性高, 选择性和吸附精度高, 其他共存阴离子干扰小。
- **High Adsorption Performance:** Fast adsorption rate for phosphate ions, high activity, excellent selectivity, and precision. The interference from coexisting anions is minimal.
- **经济高效:** 处理效果好, 运行成本低, 适合大规模应用。
- **Economical and Efficient:** Superior treatment performance with low operating costs, making it suitable for large-scale applications.
- **机械强度和稳定性:** 机械强度高, 稳定性好, 使用寿命长。
- **High Mechanical Strength and Stability:** The adsorbent has excellent mechanical strength, stability, and a long service life.

深度除重金属树脂-HP706

Deep Heavy Metal Removal Resin - HP706

产品优点

Advantages

- **高效选择性吸附:** 表面具有特种螯合基团, 能高效选择性吸附重金属离子, 吸附顺序为 $UO_2^{2+} > Pb^{2+} > Cu^{2+} > Zn^{2+} > Ni^{2+} > Cd^{2+} > Co^{2+} > Ca^{2+} > Mg^{2+} > Sr^{2+} > Ba^{2+}$ >> 碱金属, 适用于能源金属液中钙镁等重金属杂质的去除。
- **High-efficiency selective adsorption:** HP706 resin has special chelating groups on the surface, which can efficiently and selectively adsorb heavy metal ions, the adsorption order is $UO_2^{2+} > Pb^{2+} > Cu^{2+} > Zn^{2+} > Ni^{2+} > Cd^{2+} > Co^{2+} > Ca^{2+} > Mg^{2+} > Sr^{2+} > Ba^{2+}$ >> Alkali metals, suitable for removal of heavy metal impurities such as calcium and magnesium from energy metal liquids.
- **优异的水力扩散性能:** 树脂的高分子聚合物结构具有丰富的纳米孔道和均匀的交联度, 水力扩散性能优异, 确保吸附速率快、吸附精度高。
- **Excellent hydraulic diffusion performance:** The polymer structure of the resin is rich in nanopore channels and uniform cross-linking degree, with excellent hydraulic diffusion performance, ensuring fast adsorption rate and high adsorption precision.
- **高吸附容量:** 具有较大的吸附容量, 能够处理高浓度的重金属离子, 提升处理效率。
- **High adsorption capacity:** With a large adsorption capacity, it is able to treat high concentrations of heavy metal ions and improve treatment efficiency.
- **机械强度高:** 树脂机械强度高, 能够承受较高的操作压力和水流冲击, 减少破损和损耗, 延长使用寿命。
- **High adsorption capacity:** With a large adsorption capacity, it is able to treat high concentrations of heavy metal ions and improve treatment efficiency.
- **化学稳定性好:** 树脂在较宽的pH范围和温度条件下保持稳定, 适应性强, 能够在复杂工况下稳定运行。
- **Good chemical stability:** The resin remains stable in a wide pH range and temperature conditions, is adaptable, and is capable of stable operation under complex working conditions.
- **脱附简单、成本低:** 脱附方法简单, 成本低, 通过简单的再生步骤(如酸洗或碱洗)恢复吸附性能, 降低成本。
- **Simple and low-cost desorption:** The desorption method is simple and low-cost, and the adsorption performance is restored by a simple regeneration step (e.g., acid or alkali washing), which reduces the cost.



应用场景

Application Scenarios

- 电镀废水深度除镍、铜、铅、锌; 硫酸溶液除铅锌; PCB板废水回收; 三元电池回收镍钴; PTA行业废水处理; 铝型材、不锈钢清洗废水处理; 冶金废水除镍。
- 含镍、钴等料液除钙镁; 含镍、钴等料液除钙镁; 硬水软化和纯水制备, 可降至0.1mg/L以下。
- Deep removal of nickel, copper, lead, and zinc from electroplating wastewater; lead and zinc removal from sulfuric acid solutions; PCB board wastewater recovery; nickel and cobalt recovery in ternary battery recycling; PTA industry wastewater treatment; aluminum profile and stainless steel cleaning wastewater treatment; nickel removal in metallurgical wastewater.
- Removal of calcium and magnesium from lithium-containing feed solutions; removal of calcium and magnesium from nickel- and cobalt-containing feed solutions; water softening and pure water preparation (can reduce levels to below 0.1 mg/L).
- 铜矿废水处理, 电解液回收铜。
- Copper mine wastewater treatment and copper recovery from electrolyte solutions.

提钴树脂-HPC001

Cobalt Extracting Resin - HPC001

产品优点

Advantages

- **高活性和高稳定性:** 利用高分子聚合物孔道的“限域效应”高效负载钴纳米吸附剂, 确保吸附剂具有高活性和高稳定性, 适合长期使用。
- **High activity and stability:** The “domain-limiting effect” of polymer pores is utilized to efficiently load cobalt nanoscale adsorbent, which ensures that the adsorbent has high activity and high stability and is suitable for long-term use.
- **卓越的物理化学性能:** 耐冲刷性能良好, 能够承受高流速和复杂工况。物化性质稳定, 机械性能优异, 百次吸附/脱附溶解率低于0.1%, 使用寿命长。
- **Excellent physicochemical properties:** Good scouring resistance, able to withstand high flow rates and complex working conditions. Stable physical and chemical properties, excellent mechanical properties, 100 times adsorption / desorption dissolution rate of less than 0.1%, long service life.
- **高吸附容量:** 对钴离子的吸附容量大, 吸附效率高, 能够高效处理含钴料液。
- **High Adsorption Capacity:** It has a large adsorption capacity and high adsorption efficiency for cobalt ions, enabling efficient treatment of cobalt-containing feed liquid.
- **优异的选择性:** 即使在镍钴比大于10:1的高镍低钴环境中(如红土镍矿), 仍对钴表现出极高的选择性, 确保钴的高效分离和回收。
- **Excellent selectivity:** Even in the environment of high nickel and low cobalt with nickel-cobalt ratio more than 10:1 (e.g. laterite nickel ore), it still shows high selectivity to cobalt, ensuring efficient separation and recovery of cobalt.
- **出水稳定, 再生性能优异:** 吸附剂出水稳定性好, 再生性能优异, 可多次重复使用, 降低运行成本。
- **Stable effluent and excellent regeneration performance:** The adsorbent has good effluent stability and excellent regeneration performance, which can be reused many times to reduce the operation cost.
- **广泛适用性:** 可替代多种萃取提钴工艺, 简化工艺流程。适用于复杂矿料环境, 如红土镍矿、含钴废水等, 适应性强。
- **Wide applicability:** It can replace many kinds of cobalt extraction processes and simplify the process flow. Applicable to complex mineral environment, such as nickel laterite ore, cobalt-containing wastewater, strong adaptability.



应用场景

Application Scenarios

- 废旧锂离子电池硫酸镍液纯化。
- Purification of Nickel Sulfate Liquid from Waste Lithium ion Batteries.
- 红土镍矿提钴, 尤其是高镍低钴。
- Extracting cobalt from laterite nickel ore, especially high nickel and low cobalt.

深度除钙镁树脂-HP705

Deep Calcium and Magnesium Removal Resin - HP705

产品优点

Advantages

- **高效吸附性能:** 吸附速率快、吸附精度高、吸附容量大, 能够快速实现目标离子的深度去除。
- **High Adsorption Performance:** Fast adsorption rate, high precision, and large adsorption capacity enable rapid deep removal of target ions.
- **简单经济的脱附:** 脱附方法简单, 脱附成本低, 适合大规模应用。
- **Simple and Cost-Effective Elution:** The elution process is simple, with low costs, making it suitable for large-scale applications.
- **高机械强度和稳定性:** 机械强度高, 稳定性好, 使用寿命长。
- **High Mechanical Strength and Stability:** High mechanical strength, excellent stability, and a long service life.
- **可重复使用:** 可多次再生重复使用, 降低运行成本, 提升经济性。
- **Reusability:** Can be regenerated multiple times for repeated use, reducing operational costs and enhancing economic efficiency.



应用场景

Application Scenarios

- 锂电回收行业含锂料液除钙镁。
- Removal of calcium and magnesium from lithium-containing feed solutions in the lithium battery recycling industry.
- 硫酸锂、碳酸氢锂等料液深度除钙镁, 含锂料液去除钙镁精度更高, 可降至0.1mg/L以下。
- Deep removal of calcium and magnesium from lithium sulfate, lithium bicarbonate and other lithium-containing solutions. The precision of calcium and magnesium removal in lithium-containing solutions is significantly enhanced, achieving levels below 0.1 mg/L.
- 含镍、钴等料液除钙镁。
- Removal of calcium and magnesium from nickel-, cobalt-, and other metal-containing feed solutions.
- 硬水软化和纯水制备, 高盐废水去除废水中的钙、镁离子。
- Water softening and pure water preparation; removal of calcium and magnesium ions from high-salinity wastewater.

除钙镁树脂-HP4010

Calcium and Magnesium Removal Resin - HP4010

产品优点

Advantages

- **高选择性分离能力:** HP4010专为选择性分离钙镁离子设计, 能够高效去除钙镁杂质, 同时避免一价离子(如锂离子)的损失, 显著提升富锂液的品质。
- **High Selective Separation Performance:** HP4010 is specially designed for the selective separation of calcium and magnesium ions. It can efficiently remove calcium and magnesium impurities, while avoiding the loss of monovalent ions (e.g., lithium ions), significantly improving the quality of lithium-enriched solution.
- **吸附速率快, 活性高:** 树脂对钙镁离子的吸附速率快、活性高, 能够快速实现深度去除, 满足高纯度要求。
- **High Selective Separation Performance:** Fast Adsorption Rate and High Activity The resin features fast adsorption rate and high activity towards calcium and magnesium ions, enabling rapid deep removal to meet high-purity requirements.
- **纳米孔道丰富, 交联均匀:** 树脂具有丰富的纳米孔道和均匀的交联结构, 水力扩散性能优异, 确保吸附速率快、传质效率高。
- **Abundant Nanopores and Uniform Cross-linking:** The resin has abundant nanopores and uniform cross-linked structure, with excellent hydraulic diffusion performance, ensuring fast adsorption rate and high mass transfer efficiency.
- **机械强度高、稳定性好:** 树脂机械强度高, 抗冲刷性能优异, 物理化学性质稳定, 适合长期运行, 使用寿命长。
- **High Mechanical Strength and Good Stability:** The resin has high mechanical strength, excellent erosion resistance, and stable physical and chemical properties, making it suitable for long-term operation with a long service life.



应用场景

Application Scenarios

- **锂电湿法回收中的金属离子资源化回收及除杂:** 在磷酸铁锂与三元正极材料拆解回收过程中, 去除引入的钙镁等杂质, 提升锂资源回收效率。在云母矿石和锂辉矿石冶炼纯化过程中, 去除钙镁离子, 提升锂产品纯度。
- **Resource Recovery and Impurity Removal of Metal Ions in Lithium Battery Hydrometallurgical Recycling:** In the disassembly and recycling process of lithium iron phosphate and ternary cathode materials, introduced impurities such as calcium and magnesium are removed to improve the recovery efficiency of lithium resources. In the smelting and purification process of mica ore and spodumene ore, calcium and magnesium ions are removed to improve the purity of lithium products.
- **金属料液纯化:** 用于除钙镁处理, 提升金属料液的纯度, 适用于锂、镍、钴等能源金属的纯化。
- **Metal Feed Liquid Purification:** Used for calcium and magnesium removal treatment to improve the purity of metal feed liquid, suitable for the purification of energy metals such as lithium, nickel and cobalt.
- **含重金属废水资源深度提标:** 用于处理电镀废水等含重金属的废水, 实现资源化回收和深度提标, 满足环保排放要求。
- **Deep Standard Upgrading for Heavy Metal-Containing Wastewater Resources:** Used for treating heavy metal-containing wastewater such as electroplating wastewater, realizing resource recovery and deep standard upgrading to meet environmental discharge requirements.
- **后端锂产品制备:** 在碳酸锂或氢氧化锂的生产过程中, 提前去除钙镁离子, 确保产品纯度。特别适用于双极膜制备氢氧化锂工艺, 满足对二价阳离子的严格要求。
- **Post-end Lithium Product Preparation:** In the production process of lithium carbonate or lithium hydroxide, calcium and magnesium ions are removed in advance to ensure product purity. It is especially suitable for the lithium hydroxide preparation process via bipolar membrane, meeting the strict requirements for divalent cations.

钛系提锂吸附剂-HPL91X 系列

Titanium-based Lithium Extraction Adsorbent - HPL91X Series

产品优点

Advantages

- **高吸附容量:** HPL91X对锂离子具有卓越的吸附性能。通过增加活性粉体组分,提升吸附位点的记忆效应,使其在锂离子选择性上表现优异。即便在碱金属和碱土金属含量高达锂离子数百倍甚至数千倍的盐湖卤水或含锂料液中,仍能保持对锂离子的高效选择性。
- **High Adsorption Capacity:** HPL91X exhibits excellent adsorption performance for lithium ions. By increasing the active powder components, the memory effect of adsorption sites is enhanced, resulting in outstanding lithium ion selectivity. Even in salt lake brine or lithium-containing feed liquid where the content of alkali metals and alkaline earth metals is hundreds or even thousands of times higher than that of lithium ions, it still maintains high-efficiency selectivity for lithium ions.
- **快速吸附速率:** 通过增加扩散孔道, HPL91X在一次吸附中的回收率可达90%以上。其对温度变化具有良好耐受性,尤其适应低温环境,确保在各种条件下均能高效工作。
- **Fast Adsorption Rate:** By increasing diffusion channels, the recovery rate of HPL91X in a single adsorption cycle can reach over 90%. It has good tolerance to temperature changes, especially suitable for low-temperature environments, ensuring efficient operation under various conditions.
- **卓越机械强度:** 材料韧性显著提升,抗冲刷性能优异,物理化学性质稳定,从而保证了吸附剂的长使用寿命。
- **Excellent Mechanical Strength:** Significantly improved material toughness, excellent washout resistance, and stable physicochemical properties ensure a long service life of the adsorbent.
- **绿色环保:** 该提锂工艺绿色环保,高效无污染,不会产生二次“三废”,符合可持续发展的要求。
- **Green and environmental protection:** The lithium extraction process is green and environmental protection, high efficiency and no pollution, will not produce secondary "three wastes", in line with the requirements of sustainable development.
- **节省用量,降低浓缩成本:** 可选择性提取母液中的锂离子,节省用量,同时降低浓缩成本,提高锂收率。
- **Reduce Acid Consumption and Lower Concentration Cost:** It can selectively extract lithium ions from the mother liquor, reducing acid consumption, lowering concentration cost and improving lithium yield.
- **适应性强:** 该材料对温度变化具有良好耐受性,尤其适应低温环境,确保在各种条件下均能高效工作。
- **Adaptable:** The material has good resistance to temperature changes and is especially adapted to low-temperature environments, ensuring efficient work under all conditions.



应用场景

Application Scenarios

- 适用于油气田地下水、西藏碳酸型盐湖、海外低镁硫酸型盐湖提锂、锂电池回收行业,特别是偏碱性的含锂料液。
- HPL91X is suitable for extracting lithium from oil and gas field underground brine, Xizang carbonate salt lakes, overseas low magnesium sulfate salt lakes, and lithium battery recycling industries, especially the alkaline lithium containing liquid.

磷酸铁液除铝、铜树脂- HP606

Aluminum and Copper Removal Resin for Ferric Phosphate Solution - HP606



应用场景

Application Scenarios

- 锂电湿法回收中的金属离子资源化回收。
- Resource recovery of metal ions in hydrometallurgical processes for lithium battery recycling.
- 电镀废水等其他含重金属废水深度提标。
- Deep Standard Upgrading for Electroplating Wastewater and Other Heavy Metal-Containing Wastewater
- 含络合态重金属的深度处理。
- Deep treatment of complexed heavy metals.

产品优点

Advantages

- **吸附速率快、精度高、材料强度高,脱附方法简便,使用寿命长,可多次重复使用。**
Fast adsorption rate, high selectivity, excellent mechanical strength, simple desorption, long service life, and reusability.
- **高选吸附容量:** 单位体积对阳离子的吸附量远超普通市售材料,吸附效率更高。
- **High Adsorption Capacity:** Its adsorption capacity for cations per unit volume far exceeds that of ordinary commercially available materials, with higher adsorption efficiency.
- **优异的耐化学性:** 耐酸碱腐蚀,机械强度高,抗磨损性能好,使用寿命长。
- **Excellent Chemical Resistance:** Resistant to acid and alkali corrosion, with high mechanical strength, excellent wear resistance, and a long service life.
- **稳定的表面性能:** 脱附过程中酸/盐对其表面无影响,性能无衰减,可长期承受多次酸/盐再生解析。
- **Stable Surface Properties:** Acid/salt exposure during desorption does not affect its surface properties ensuring no performance degradation and long-term durability under repeated acid/salt regeneration processes.

铝系提锂吸附剂-HPL16X 系列

Aluminum-based Lithium Extraction Adsorbent - HPL16X Series



应用场景

Application Scenarios

- **盐湖提锂:** 适用于偏酸性至中性(pH4-8)料液提锂如盐湖老卤水、原卤水直接提锂;适合高原/高寒地区盐湖开发及冬季卤水低温环境作业。
- **Lithium Extraction from Salt Lake Brines:** Suitable for lithium extraction from feed solutions that are slightly acidic to neutral (pH 4-8), such as aged salt lake brines or direct extraction from raw brines. Ideal for salt lake development in plateau/alp regions and operations in low-temperature brine environments during winter.
- **锂资源回收:** 从含锂电液、粉煤灰酸浸等工业废水中回收锂资源,实现金属资源循环利用。
- **Lithium Resource Recovery:** Recovers lithium resources from industrial wastewater, including lithium-containing electroplating solutions and fly ash acid leaching solutions, enabling the recycling of metal resources.

产品优点

Advantages

- **高效吸附性能:** 最新一代纳米孔道工艺提升锂扩散速率,低温环境中仍保持高吸附效率,减少温度对性能影响。
- **Efficient Adsorption Performance:** The latest generation nano-porous structure technology enhances lithium diffusion kinetics, maintaining high adsorption efficiency even in low-temperature environments, thereby minimizing the impact of temperature on performance.
- **超高选择性:** 单次吸附/脱附实现镁锂比<1、钠锂比<0.5,相同工艺下,使用更少的淋洗液即可保证脱附液杂质离子达标,大幅提高吸附剂的工作效率,增加锂产量,并大幅降低水耗。
- **Ultra-High Selectivity:** Achieves Mg/Li ratio <1 and Na/Li ratio <0.5 in a single adsorption/desorption cycle. Under the same process conditions, it requires less eluent to ensure impurity ions in the desorption solution meet standards, significantly improving adsorbent working efficiency, increasing lithium yield, and substantially reducing water consumption.
- **稳定性强:** 具备优异的机械强度和韧性。物化性质稳定,吸附剂年溶损率<5%,在冬季低温卤水粘度大的工况下不板结,无需频繁停机维护。
- **Excellent Stability:** Possesses outstanding mechanical strength and toughness. It features stable physicochemical properties, with an annual dissolution rate of less than 5% for the adsorbent. It does not compact under conditions of high-viscosity brine in low winter temperatures, eliminating the need for frequent shutdowns for maintenance.
- **强抗污染能力:** 纳米掺杂工艺全面提高了吸附剂的抗硫酸根离子污染能力,即使是硫酸根离子浓度40g/L以上的盐湖原卤水,也能保证吸附剂长期稳定运行。
- **Strong Anti-Fouling Capability:** The nano-doping process comprehensively enhances the adsorbent's resistance to sulfate ion fouling. It ensures long-term stable operation of the adsorbent even in raw salt lake brines with sulfate ion concentrations exceeding 40g/L.
- **绿色低碳工艺:** 吸附时仅提取料液中的氯化锂,吸附后的料液中不引入其他化学元素,可直接排放回盐湖或进入下一工段;脱附时仅使用纯水,安全节能。
- **Green and Low-Carbon Process:** During adsorption, it selectively extracts only lithium chloride from the feed solution. No other chemical elements are introduced into the solution post-adsorption, allowing it to be directly discharged back to the salt lake or sent to the next process stage. Desorption uses only pure water, making it safe, energy-efficient, and environmentally friendly.

贵金属树脂提取-HP4080

Precious Metal Resin Extraction-HP4080

产品优点

Advantages

- **高选择性吸附:** HP4080树脂具有特殊的手性功能基,能够选择性吸附料液中的贵金属(如金、银、铂、钯等),并将其牢固地结合在功能基上,形成高度稳定的复合物。相较于其他重金属,其对贵金属具有更高的亲和力。
- **High selective adsorption:** HP4080 resin has a special chiral functional group, which can selectively adsorb precious metals (such as gold, silver, platinum, palladium, etc.) in the feed solution and firmly bind them to the functional group to form a highly stable complex. Compared with other heavy metals, it has a higher affinity for precious metals.
- **大孔结构设计:** 树脂采用大孔结构的苯乙烯-二乙烯基骨架,具有丰富的孔道和较大的比表面积,确保吸附速率快、传质效率高,适合处理高流速和高浓度的料液。
- **Macroporous structure design:** The resin adopts a styrene-divinylbenzene skeleton with a macroporous structure, which has abundant pore channels and a large specific surface area, ensuring a fast adsorption rate and a high mass-transfer efficiency, making it suitable for treating high-flow rates and high concentrations of material liquids.
- **高度稳定的复合物形成:** 树脂与贵金属形成的复合物稳定性高,能够有效防止贵金属的流失,确保高效回收。
- **Highly stable complex formation:** The resin and precious metal form a highly stable complex, which can effectively prevent the loss of precious metals and ensure efficient recovery.
- **优异的物理化学性能:** 树脂机械强度高,耐冲刷性能好,适合长期运行;化学稳定性优异,能够在较宽的pH范围和温度条件下保持稳定。
- **Excellent physical and chemical properties:** The resin has high mechanical strength and good scouring resistance, which is suitable for long-term operation; it has excellent chemical stability and can remain stable under a wide range of pH and temperature conditions.
- **高吸附容量:** 树脂对贵金属具有较高的吸附容量,能够高效处理含贵金属的料液提升回收效率。
- **High adsorption capacity:** The resin has a high adsorption capacity for precious metals which enables it to efficiently process the precious metal-containing material and enhance the recovery efficiency.
- **再生性能优异:** 树脂可通过简单的再生步骤(如酸洗或碱洗)恢复吸附性能,再生性能优异,可多次重复使用,降低运行成本。
- **Excellent regeneration performance:** The resin can restore the adsorption performance through simple regeneration steps (such as acid or alkali washing), with excellent regeneration performance, and can be reused many times to reduce operating costs.



应用场景

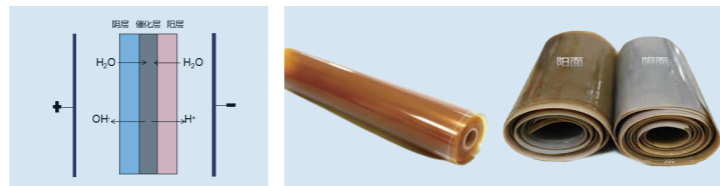
Application Scenarios

- 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。
- It can realize the extraction and separation of precious metals such as gold, silver, platinum and palladium, e.g., extracting precious metals from the metallurgical industry, rinsing water and leaching solutions of electroplating and electronic industries; Deep removal of low-concentration soluble mercury salts in wastewater.

双极膜产品简介

Bipolar Membrane Product Introduction

双极膜（Bipolar Membrane, BPM）是一种特殊的离子交换膜，由阴离子交换层（AEL），阳离子交换层（CEL）和中间催化层复合而成。在电场作用下，双极膜能够将水分子解离为H⁺和OH⁻，从而实现酸和碱的同步生成。这一特性使得双极膜在制备氢氧化锂（LiOH）等化学物质中具有独特的优势。



Bipolar membrane (BPM) is a special type of ion exchange membrane composed of an anion exchange layer (AEL), a cation exchange layer (CEL), and an intermediate catalytic layer. Under the action of an electric field, bipolar membranes can dissociate water molecules into H⁺ and OH⁻, thereby achieving synchronous generation of acids and bases. This characteristic gives bipolar membranes a unique advantage in the preparation of chemical substances such as lithium hydroxide (LiOH).

海普提供多种型号的双极膜产品，以满足不同应用需求：

Haipu offers a wide range of bipolar membrane products to meet different application requirements:

双极膜 Bipolar membrane	产品型号 Product Models	尺寸 Size(cm)	厚度 Thickness(μm)	破裂强度 Rupture Strength(MPa)	使用温度 Operating Temperature(°C)	pH	碱浓度 alkali concentration(mol/L)	酸碱纯度 Acid base purity
	BPM-100 (标准型Standard type)	20*40、 40*80、 55*110 可定制尺寸 (Customizable Size)	150±20	≥0.5	15~40	0~14	2.5	97.5%
	BPM-200 (高性能型High performance type)		150±20	≥0.5	15~40	0~14	3	99%
	BPM-300 (定制型Customized type)		150±20	≥0.5	15~40	0~14	≥2.5	≥97.5%

产品优点

Advantages

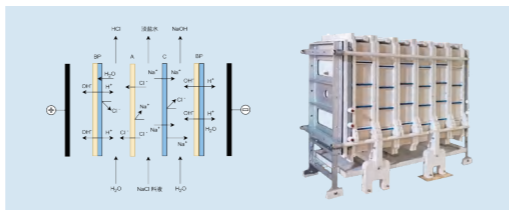
- 效率高：**可在低电压下进行水解，效率稳定。
High efficiency: Hydrolysis can be carried out at low voltage with stable efficiency.
- 能耗低：**单片型双极膜工艺，界面电阻低，运行能耗低。
Low energy consumption: The single-chip bipolar membrane process has low interface resistance and low operating energy consumption.
- 寿命长：**采用优质材料，且双极膜界面阴阳膜互相交联、融合，耐溶胀，具有优异的化学稳定性和机械强度，使用寿命长。
Long service life: Made of high-quality materials, the bipolar membrane features interconnected and fused anion and cation membranes at the interface, which is resistant to swelling and possesses excellent chemical stability and mechanical strength, ensuring a long service life.
- 绿色环保：**双极膜技术可使传统工艺减少使用化学试剂，减少污染物排放，变废为宝，实现资源的循环利用，符合绿色化学理念。
Green environmental protection: Bipolar membrane technology can reduce the use of chemical reagents in traditional processes, decrease pollutant emissions, turn waste into treasure, and achieve resource recycling, aligning with the concept of green chemistry.

双极膜电渗析装置

Bipolar membrane electro dialysis device

双极膜电渗析装置是在传统电渗析基础上创新的高效集成系统。其核心由阴、阳膜与关键的双极膜交替排列构成。该装置实现了“盐转化”与“酸碱再生”的革命性功能。它无需外加酸、碱，即可将盐溶液(如氯化钠、硫酸锂)直接转化为对应的酸(如盐酸)和碱(如氢氧化钠)，同时完成物料的分离与浓缩，这一特点使其在盐湖提锂领域极具价值。

The bipolar membrane electro dialysis device consists of alternating anion and cation membranes and key bipolar membranes, which can directly convert salt solution into corresponding acids and bases without the need for external acids or bases, while completing material separation and concentration. This feature makes it highly valuable in the field of lithium extraction from salt lakes.



应用场景

Application scenarios

“AM-CM-BP三隔室”组合：即装置采用耐酸碱阴、阳离子交换膜、双极膜，可用无机盐制备相应的无机酸/无机碱，如通入氯化锂和水，可将其转化为氢氧化锂和盐酸，除此之外，硫酸锂、氯化钠、硫酸钠、硝酸钾等强酸强碱无机盐都适用。

“AM-CM-BP three-compartment” combination: The device adopts acid and alkali resistant anion, cation, and bipolar membranes, and can prepare corresponding inorganic acids/bases using inorganic salts. If lithium chloride and water are introduced, they can be converted into lithium hydroxide and hydrochloric acid. In addition, strong acid and strong alkali inorganic salts are also applicable.

应用行业

Application Industry

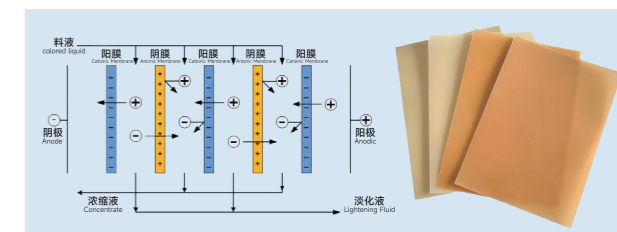
- 新能源行业：**在盐湖、矿业、电池回收正极黑粉等行业制备氢氧化锂产品表现出色，甚至可达到电池级氢氧化锂的纯度。
- New energy industry:** Excellent performance in the preparation of lithium hydroxide products in industries such as salt lakes, mining, and battery recycling of cathode black powder, even achieving the purity of battery-grade lithium hydroxide.
- 电镀、化工、制药等行业：**可用于回收废酸和废碱，产生的新酸/新碱可再次利用，降低生产成本。
- Industries such as electroplating, chemical, and pharmaceuticals:** It can be used to recycle waste acid and waste alkali, and the generated new acid/alkali can be reused, reducing production costs;
- 食品加工行业：**可用于调节pH值，提高产品质量和安全性。
- Food processing industry:** It can be used to adjust pH value, improve product quality and safety.
- 环保领域：**可用于处理工业废水，减少污染物排放，保护环境。
- In the field of environmental protection:** It can be used to treat industrial wastewater, reduce pollutant emissions, and protect the environment.

电渗析均相膜产品简介

Product Profile of Electrodialysis Homogeneous Membrane

电渗析均相膜一种具有离子交换功能的高分子材料制成的薄膜，其内部的离子交换基团在整个膜内呈均匀分布，从微观结构上看，膜内的高分子聚合物基体与离子交换基团之间不存在明显的相界面，是一种高度均匀的体系。通常分为均相阳离子膜和均相阴离子膜。

Electrodialysis homogeneous membrane is a thin film made of polymer material with ion exchange function. The ion exchange groups inside the membrane are uniformly distributed throughout the membrane. From a microscopic perspective, there is no obvious phase interface between the polymer matrix and the ion exchange groups inside the membrane, making it a highly uniform system. Usually divided into homogeneous cation membrane and homogeneous anion membrane.



海普提供多种型号的电渗析均相膜产品，以满足不同应用需求：

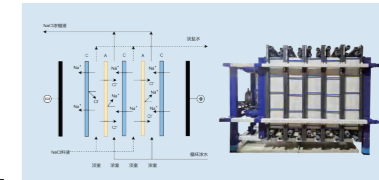
Haipu offers a wide range of electrodialysis homogeneous membranes to meet the needs of different applications:

电渗析 均相膜 Electrodialysis homogeneous membrane	产品型号 Product Models	尺寸 Size(cm)	厚度 Thickness(μm)	破裂强度 Rupture Strength(MPa)	使用温度 Operating Temperature(°C)	pH	选择性透过系数 Selective Permeability coefficient	电阻 resistance(Ω·cm ²)	浓缩上限值 Concentration upper limit value (g/L)
	HP-AM-100 (浓缩型Concentrated type)	20*40、 40*80、 55*110 可定制尺寸 Customizable Size	70~100	≥1.0	15~40	0~12	≥98%	≤2.5	200
	HP-AM-200 (脱盐+I型Desalination - Type I)		70~100	≥1.0	15~40	0~11	≥97%	≤2.5	180
	HP-AM-300 (脱盐+II型Desalination - Type II)		70~100	≥1.0	15~40	0~11	≥98%	≤2.5	190
	HP-AM-400 (耐酸碱型Acid and alkali resistant type)		70~100	≥1.0	15~40	0~14	≥97%	≤3	150
	HP-CM-100 (浓缩型Concentrated type)		70~100	≥1.0	15~40	0~12	≥98%	≤2.5	170
	HP-CM-200 (脱盐型Desalination type)		70~100	≥1.0	15~40	0~11	≥97%	≤2.5	180
	HP-CM-300 (耐酸碱型Acid and alkali resistant type)		70~100	≥1.0	15~40	0~14	≥97%	≤3	150

电渗析装置

Bipolar membrane electro dialysis device

该系统由阳、阴离子交换膜交替堆叠而成，中间用隔板隔开，并配有电极板、端板和其他组件。工作原理为膜堆交替使用阴、阳离子膜，形成脱盐和浓缩系统。在直流电场影响下，当盐水被引入隔间时，阳离子只通过阳离子交换膜向阳极迁移，而阴离子只通过阴离子交换膜向阳极迁移，从而使得盐水在稀释区实现脱盐，在浓缩区完成浓缩。



The system is composed of alternating stacking of cation and anion exchange membranes, separated by partitions, and equipped with electrode plates, end plates, and other components. The working principle is that the membrane stack alternately uses anionic and cationic membranes to form a desalination and concentration system. Under the influence of a direct current electric field, when saltwater is introduced into the compartment, cations only migrate to the cathode through the cation exchange membrane, while anions only migrate to the anode through the anion exchange membrane, thereby achieving desalination of saltwater in the dilution zone and concentration in the concentration zone.

应用优势

Application advantages

- 离子交换容量高：**均相离子交换膜具有分布均匀的离子交换基团，且其含量较高，所以能够有效地与溶液中的离子进行交换反应，可用于高效的离子分离和富集。
- High efficiency:** Homogeneous membranes have uniformly distributed ion exchange groups that can undergo ion exchange reactions and can be used for efficient ion separation and enrichment.
- 选择性好：**可识别不同离子的电荷、大小和水化半径等差异，优先选择特定的离子通过膜，在混合离子体系中实现精准的离子分离。
- Good selectivity:** It can recognize the differences in charge, size, and hydration radius of different ions, and preferentially select specific ions to pass through the membrane, achieving precise ion separation in a mixed ion system.
- 浓缩浓度高：**适合一价盐的高倍浓缩，浓缩浓度可达180g/L（以氯化钠计），比常规膜浓缩工艺高一倍，还可有效减少浓水水量。
- High concentration:** suitable for high fold concentration of monovalent salts, with a concentration of up to 180g/L, twice as high as conventional membrane concentration processes, and can effectively reduce the amount of concentrated water.
- 纯度高：**不带电物质如COD、硼酸根、硅酸根、氨基酸等不会迁移，使制备的工业盐纯度更高。
- High purity:** Non charged substances such as COD and silicate ions do not migrate, resulting in higher purity of industrial salts prepared;
- 能耗低：**结构均匀，离子在膜内的传输阻力小，膜电阻较低，较常规工艺（蒸发、反渗透等）节能50%以上，降低了处理负荷和电能消耗，提高了能源利用效率。
- Low energy consumption:** uniform structure, low membrane resistance, energy saving of more than 50% compared to conventional processes, reducing load and electricity consumption, and improving energy utilization efficiency.
- 化学稳定性好：**在较宽的pH范围和多种化学环境下保持稳定，不易发生化学降解或结构破坏，可耐受强酸、强碱以及多种有机溶剂的侵蚀，适用于处理各种复杂的化学体系。
- Good chemical stability:** Stable in a wide pH range and various chemical environments, resistant to strong acids, strong bases, and various organic solvents, suitable for handling complex chemical systems.
- 安全可靠：**运行压力0.05MPa，低温、低压运行安全可靠，抗冲击能力强。
- Safe and reliable:** Operating pressure of 0.05MPa, safe and reliable operation at low temperature and low pressure, with strong impact resistance.

电渗析装置应用场景

Application scenarios of electro dialysis device

电渗析装置主要应用于无机盐溶液的浓缩或淡化（如盐湖提锂、废水脱盐）、工业酸碱的浓缩回收、高盐废水分盐及零排放处理，以及物料中无机盐与有机物的分离纯化，是实现资源回收和环保达标的关键技术之一。

可用于氯化锂、硫酸锂、氯化钠、氯化钙、氯化钾、硫酸钾、硫酸钠、硝酸铵、氟化铵、硫酸铵、氯化铵或者混和无机盐溶液的浓缩或淡化；酸碱浓缩；无机盐与有机物分离等。

Electrodialysis devices are mainly used for concentration or desalination of inorganic salt solutions, concentration and recovery of industrial acid and alkali, salt separation and zero discharge treatment of high salt wastewater, as well as separation and purification of inorganic salts and organic matter in materials. They are one of the key technologies for achieving resource recovery and environmental standards.

Can be used for concentration or desalination of lithium chloride, ammonium fluoride, ammonium sulfate, or mixed inorganic salt solutions; Acid-base concentration; Separation of inorganic salts from organic compounds, etc.

盐湖提锂

lithium extraction from salt lakes

盐湖提锂合格液，经反渗透、纳滤除杂浓缩后Li5~7g/L，需要继续浓缩满足后续沉锂或制备氢氧化锂的需求，电渗析浓缩Li浓度达14~15g/L，浓缩过程同步除硼，除硼率达92%以上。

The qualified lithium extraction solution from salt lakes undergoes reverse osmosis and nanofiltration to remove impurities and concentrate Li at a concentration of 5-7g/L. It needs to be further concentrated to meet the needs of subsequent lithium deposition or preparation of lithium hydroxide. The concentration of Li by electro dialysis reaches 14-15g/L, and the concentration process is synchronized with boron removal, with a boron removal rate of over 92%.

优势

Advantage

01

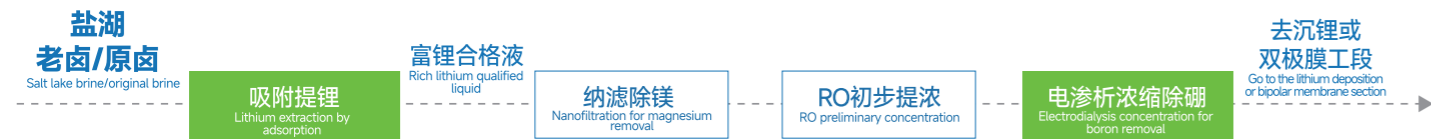
浓缩浓度高，较RO工艺浓度翻一番，有效减少浓水水量。

High concentration, doubling the concentration compared to RO process, effectively reducing the amount of concentrated water;

02

相比于反渗透需五级除硼，且需要加大量碱的情况，电渗析除硼工艺简单，除硼率可达92%以上，锂回收率可达99.5%，锂浓度可浓缩至21g/L以上，可直接沉锂，无需添加大量药剂。

Compared to reverse osmosis, which requires five levels of boron removal and the addition of a large amount of alkali, electro dialysis has a simpler boron removal process, with a boron removal rate of over 92%, a lithium recovery rate of 99.5%, and a lithium concentration of over 21g/L. It can directly precipitate lithium without the need for adding a large amount of chemicals.

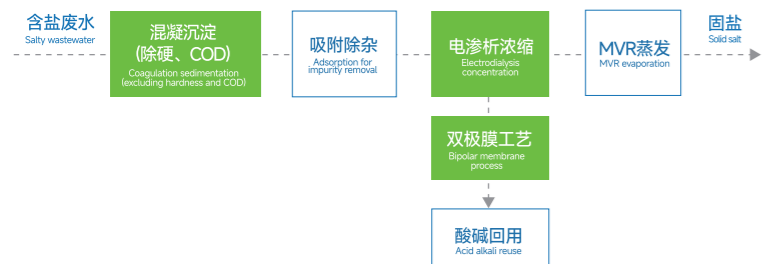


废水处理

Wastewater treatment

工业园区含盐废水经过电渗析浓缩处理，盐浓度可达150g/L，电渗析浓水进MVR蒸发，减少直接蒸发的投资和能耗；或电渗析浓水进一步用双极膜制备酸碱，实现盐制酸碱的资源循环利用；电渗析淡水可进行中水回用或组合RO膜进一步产纯水回用。

Salt containing wastewater undergoes electro dialysis concentration treatment, with a salt concentration of up to 150g/L. Electro dialysis of concentrated water can be further used to prepare acid and alkali using bipolar membranes, achieving resource recycling for salt based acid and alkali production; Electro dialysis of fresh water can be used for reclaimed water reuse or combined with RO membranes to further produce pure water reuse.



物料分离

Material separation

氨基酸、甜菜碱、酱油、乳清等料液在化工生产过程中，料液中含有一定量的无机盐（NaCl、Na₂SO₄、(NH₄)₂SO₄等），采用电渗析工艺，可有效将物料中的盐脱除而不影响产品中其他组分，脱盐率和根据不同产品要求进行调节，物料损耗率低；

Amino acids, betaine, soy sauce, whey and other feed solutions contain a certain amount of inorganic salts (NaCl, Na₂SO₄, (NH₄)₂SO₄, etc.) in the chemical production process. By using electro dialysis technology, the salts in the materials can be effectively removed without affecting other components in the product. The desalination rate can be adjusted according to different product requirements, and the material loss rate is low.

优势 Advantage

• 可替代或部分替代离子交换树脂或电渗析预处理+树脂深度吸附组合工艺，脱盐速度快、脱盐能耗低。

Can replace or partially replace ion exchange resin or electro dialysis pretreatment+resin deep adsorption combination process, with fast desalination speed and low desalination energy consumption.

• 膜不需要再生、工艺简单、不引入其他化学试剂，无二次污染。

The membrane does not require regeneration, has a simple process, does not introduce other chemical reagents, and has no secondary pollution.

电渗析/双极膜电渗析装置技术特点

Technical characteristics of electro dialysis/bipolar membrane electro dialysis device

4 大核心优势



电渗析和双极膜电渗析装置装备MOS电源，采用双DSP高速数字信号处理技术，较常规配置电源具有高精度、低纹波、高动态响应速度，支持不间断电源更换，转换率达97%以上，高海拔不降容，功率因数达0.99，对膜的性能及寿命影响极小，保证装置运行效率和稳定性。

Equipped with MOS power supply, adopting dual DSP high-speed digital signal processing technology, supporting uninterrupted power supply replacement, with a conversion efficiency of over 97%, no capacity reduction at high altitude, and a power factor of 0.99. It has minimal impact on the performance and lifespan of the membrane, ensuring the operational efficiency and stability of the device.



采用液压式的膜堆，上下双压头压紧的方式保证膜堆受力均匀，从而使膜堆内部水流分布均匀，有效降低占地面积，同时有效减少膜堆漏水、漏电、烧膜风险，提高电流效率。

Adopting a hydraulic membrane stack, the upper and lower pressure heads are pressed together to ensure uniform force distribution inside the membrane stack, effectively reducing the footprint and minimizing the risks of water leakage, electric leakage, and membrane burning, thereby improving current efficiency.



隔板采用具有良好密封性的弹性复合PP材质，不变形，减少系统50%漏液量，降低生产维护工作量。

The partition is made of elastic composite PP material with good sealing performance, which does not deform, reduces the system's leakage by 50%, and reduces production and maintenance workload.



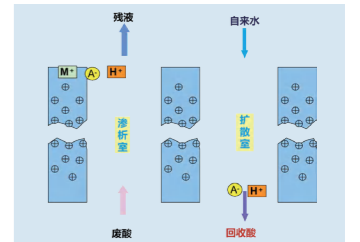
采用工控机和PLC控制整个系统，动态显示整个系统运行工况，重要运行参数如电流、电压、电导率、浓度等，直接形成趋势曲线，更形象的反应运行过程，有助更好的优化工艺操作。

The entire system is controlled by an industrial computer and PLC, dynamically displaying the operating conditions of the entire system. Important operating parameters such as current, voltage, conductivity, concentration, etc. are directly formed into trend curves, which more vividly reflect the operating process and help optimize process operations.

扩散渗析装置

Diffusion dialysis device

扩散渗析法回收酸采用渗析原理，以浓差为推动力，整个装置由扩散渗析膜、配液板、加强板、液流板框等组合而成，由一定数量的膜组成的结构单元；其中每个单元由一张阴离子均相膜隔开成渗析室(A)和扩散室(B)，构成扩散渗析装置。膜两侧分别通入废酸液和纯水时，因浓度差作用，含酸液中的游离酸及其盐类会向纯水侧渗透，阴离子膜带正电荷，能选择性吸引负离子通过，同时为维持电中性会夹带正离子。酸中H⁺浓度高且水化半径小、电荷少，相比金属离子更易透过，从而实现酸的分离或回收。



The diffusion dialysis method for acid recovery is based on the principle of dialysis, driven by concentration difference. The device consists of diffusion dialysis membrane, distribution plate and other components. The core unit is separated into dialysis chamber (A) and diffusion chamber (B) by anion homogeneous membrane. After introducing waste acid solution and pure water, free acids and salts in the waste acid permeate towards the pure water side due to the concentration difference; Anion membranes selectively pass through negative ions and carry positive ions to maintain electrical neutrality. Due to the high concentration of H⁺, small hydration radius, and low charge, it is easier for H⁺ ions to pass through the membrane than metal ions, ultimately achieving acid separation and recovery.

优势特点 Advantages and Features

• **高效节能，降本增效：**专为金属表面处理工序设计，依托浓度差驱动无需外部能量输入，可高效回收废液中有有效酸并直接回用于生产，既减少新酸采购成本，又降低废液中和处理费用，实现降本增效与节能环保的双重效益。

Efficient and energy-saving, cost reduction and efficiency improvement: Specially designed for metal surface treatment processes, relying on concentration differences to drive without external energy input, it can efficiently recover effective acids from acid waste liquid and directly reuse them in production, reducing the cost of new acid procurement and the cost of waste liquid neutralization and treatment, achieving dual benefits of cost reduction and efficiency improvement as well as energy conservation and environmental protection.

• **稳定槽液，提升品质：**可连续地从处理槽中分离并去除累积的金属离子，有效稳定槽液成分与工艺参数，保障处理质量的一致性。

Stabilize the tank solution and improve quality: It can continuously separate and remove accumulated metal ions from the treatment tank, effectively stabilizing the composition of the tank solution and process parameters, ensuring consistency in treatment quality.

• **撬装模块，省心便捷：**装置采用撬块式设计，结构紧凑简单，出厂前已完成预制，极大缩短了现场安装与调试周期，日后维护轻松便捷。

Pry installation module, worry free and convenient: The device adopts a pry block design, with a compact and simple structure. It has been prefabricated before leaving the factory, greatly reducing the on-site installation and debugging cycle, and making maintenance easy and convenient in the future.

海普新能源领域解决方案优势

Advantages of HAIPU New Energy 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。能够高效、精准匹配客户需求，提供定制化的一站式解决方案。拥有全产业链原创分离纯化技术，高精度处理可高效实现杂质去除及有价值资源回收。

Haipu is deeply involved in the new energy lithium battery industry chain, forming an extraction, purification, and recycling solution covering the entire chain of "resource extraction key battery material purification lithium battery recovery". Capable of efficiently and accurately matching customer needs, providing customized one-stop solutions. Having original separation and purification technology throughout the entire industry chain, high-precision processing can efficiently achieve impurity removal and valuable resource recovery.

操作简便

- 工艺流程简洁,集成装置施工,安装操作简便,易于管理。
- **Easy operation:** The process flow is simple, and the integrated device is easy to construct, install and operate, and convenient to manage.

环境友好

- 减少有害溶剂的使用,助力企业可持续发展。
- **Environmentally friendly:** Reduce the use of harmful solvents and help companies achieve sustainable development.

降本节能

- 填料载量高,用量少,设备投资低。
- **Cost reduction and energy saving:** High filler load, low dosage and low equipment investment.



提质增效

- 树脂产品具有高选择性,可高效吸附目标物质。
- **Improve quality and increase efficiency:** Resin products have high selectivity and can efficiently adsorb target substances.

安全可靠

- 在分离过程中保持稳定,不引入系统以外的杂质离子。
- **Safe and reliable:** It remains stable during the separation process and does not introduce impurity ions outside the system.

产业适用

- 易于规模化生产,满足工业应用的需求。
- **Industrial applicability:** Easy to mass produce and meet the needs of industrial applications.

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，选择性强，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 1500m³ 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 fluoride 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.

BENEFIT

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.

安徽新能源料液纯化除镍项目

Anhui New Energy Material Purification and Nickel Removal Project

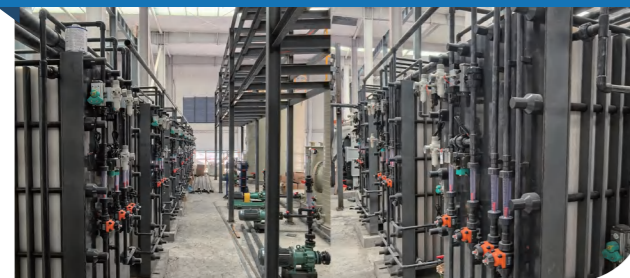


安徽某企业锂电池回收硫酸铵溶液含镍钴锰，采用HP4040吸附工艺，将镍钴锰分别从 <10mg/L、<10mg/L、<50mg/L降至 <1mg/L，硫酸铵溶液回用。HP4020树脂选择性强，吸附量大，再生周期长，运行成本低，实现资源循环利用。

Ammonium sulfate solution from lithium battery recycling of an enterprise in Anhui 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.

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电渗析装置，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% H₂SO₄) 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.

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.

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。工艺选择性强，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.

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.



CASE