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CleanTech Lithium PLC
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CleanTech Lithium PLC ("CleanTech Lithium" or the "Company")
Positive DLE Process Test Work Leads to Adsorbent Selection for Pilot Plant

CleanTech Lithium PLC (AIM:CTL, Frankfurt:T2N, OTCQX:CTLHF) an exploration and development company advancing lithium projects in Chile, reports the results of recent completed Direct Lithium Extraction (DLE) process test work. The positive results have informed the selection and ordering of the lithium adsorbent to be used in the Company´s pilot plant, which has finished construction at the Company´s R&D Centre in Copiapó and is in the process of being commissioned and tested.

DLE Process Work Highlights:

- Extensive Direct Lithium Extraction (DLE) work undertaken in 2023 to optimise the process
- Progress in the process work has now led to the selection of adsorbent from Xián Lanshen New Material Technology (Lanshen) as the preferred adsorbent for the Company´s pilot plant
- Recently completed multi-cycle tests on Laguna Verde brine produced very positive results for key DLE metrics: adsorbent capacity, lithium recovery rates, and eluate composition
- These results are achieved without pH adjustment in pre-treatment or heating of the brine or eluant, with distilled water used for desorption

Process Test	**Result**	**Comment**
Pre-treatment	Filtering only	No pH adjustment required
Adsorption recovery rate	>95%	
Desorption recovery rate	>95%	
Lithium Loading Capacity	3.5g Li per kg	Target is 4.6g Li per kg
Eluate Composition		
Li Concentration Factor	>3X	
Na	<100mg/l	Very low
TDS	<4,000mg/l	Very low

- The results indicate that brine from Laguna Verde has low contaminants and is conducive to DLE
- The Company´s dedicated DLE testing laboratory in Antofagasta, Chile, has played an important role in testing adsorbents
- Lanshen is a leader in DLE and has signed an agreement with Koch Technology Solutions (Koch), a subsidiary of Koch Industries (USA), to exclusively distribute Lanshen adsorbent for Koch´s DLE process in the North American and European markets
- The Company´s pilot plant has now been filled with Lanshen adsorbent and is in the latter stages of commissioning

Commenting, Aldo Boitano, Chief Executive Officer, of CleanTech Lithium PLC, said:

"The DLE sector is rapidly evolving, we are seeing developments from several companies all around the world to advance the production of lithium. Our trip to China towards the end of last year was enlightening, we were able to see on the ground the remarkable opportunity DLE provides for the lithium sector and the adoption of electric vehicles and clean energy storage solutions.

Informed by the results we have announced today, our DLE pilot plant has now been loaded with Lanshen's adsorbent, and plant commissioning is in process. This is a significant milestone for the Company as we aim to achieve process and product verification in 2024."

Process Work Progress Update

CleanTech Lithium´s process team is comprised of lithium process experts in Chile with additional expertise provided by DLE sector consultants Peter Ehren and Forward Water Technologies. DLE process trials have been completed with a multitude of adsorbent* suppliers, from emerging technologies to established petrochemical companies, both at supplier facilities and at the Company´s dedicated DLE testing laboratory in Antofagasta, Chile. Globally, China has a significant presence in the DLE sector with five or more commercial scale adsorbent suppliers, all of which were visited by CleanTech Lithium in October 2023.

At the Company´s laboratory, a series of tests were carried out starting with beaker tests, then single column tests and finally multi-cycle tests using a multi-valve carousal unit. The in-house testing has given CTL the ability to directly compare different adsorbents and to verify adsorbent performance data from trials conducted at supplier facilities. A laboratory scale trial on a Lanshen carousal unit in Santiago, Chile, is shown in Figure 1.



* Adsorbent and resin are interchangeable terms in the DLE sector
Figure 1: A laboratory scale trial on a Lanshen carousal unit (Santiago, Chile)

Selection of Adsorbent for Pilot Plant

DLE process test-work produces data on the key performance metrics for a DLE adsorbent being adsorption and desorption recovery rates, lithium loading capacity, the composition of the eluate which is based on the selectivity for lithium versus other ions, along with water use and durability of the adsorbent. The Company´s 2023 process test-work led to the selection of an adsorbent supplied by Lanshen for the pilot plant testing.

Lanshen is one of the largest DLE adsorbent suppliers in China with a lithium adsorbent manufacturing capacity of 8,000m^3. Major shareholders of Lanshen include Softbank, Minmetals and CICC Capital. In the North American and European markets, Lanshen has an exclusive agreement with Koch under which Lanshen adsorbent is used in Koch´s Li-Pro DLE process. Koch Industries is the second largest private company in the USA with annual revenue of US$125 billion in 2023. Lanshen has a strong commitment to working in Chile where it has a testing facility and pilot plant located in Santiago, which has facilitated cooperation. The Lanshen pilot plant includes all unit processes from DLE through to lithium carbonate production. In October 2023, CleanTech Lithium visited Lanshen´s operating commercial DLE unit in China, which has achieved an impressive operating performance extracting lithium directly from raw brine.



Figure 2: Lanshen Pilot Unit in Santiago



Figure 3: Lanshen Commercial DLE Unit in China

Positive Results from Recently Completed Trials

The Company has completed 10 trials at the Lanshen testing and pilot facilities in Santiago, with the results of the latest trial presented in the Table below. Parameters such as the flow rates of feed brine are still being optimised and certain results such as lithium loading capacity are expected to increase further.

The Company views the results as being very positive and the performance of the Lanshen adsorbent has been superior to other adsorbents tested. This further considers that no pH adjustment is needed to pre-treat brine via adding an acid or base, and the brine and eluant is not required to be heated to a high temperature as is the case with a number of adsorbents from other suppliers. While heating of brine and eluant improves kinetics and therefore adsorbent performance, using such absorbent would need to be weighed with the additional Capex and operating cost of heating the large volume of feed brine and eluant. As with other alumina hydroxide based adsorbents, water is used as the desorption eluant as opposed to acidic eluants used in some other DLE processes.

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Table 1: Lanshen Multi-Cycle Test Summary of Key Results

Lanshen uses a double layered alumina hydroxide adsorbent, the only commercially proven DLE adsorbent. For an alumina hydroxide based adsorbent there are several contaminants that affect adsorption or desorption performance, with the key ones typically being silica, arsenic, manganese, and total organic carbon (TOC). Laguna Verde brine has an average Total dissolved solids (TDS) of approximately 140g/l which is among the lowest TDS of any JORC or NI43-101 compliant lithium brine resource in Chile or Argentina, with the key contaminants described above also being low. This is one reason the test work has produced good results without pre-treatment of the brine in the form of pH adjustment (addition of acid/base) or a large heat input for feed brine or eluant.

The Lanshen adsorbent has very high selectivity for lithium versus the other major ions in the brine with the eluate showing very low sodium (Na) (rejection over 99%) and other major ions, resulting in a low TDS eluate. This is highly conducive to the following process steps of concentration using reverse osmosis (RO) and forward osmosis (FO), and remaining impurity removal via nanofiltration (NF) and ion exchange (IX) to produce a concentrated lithium chloride solution. The lower the TDS in the eluate, the more efficient and larger the concentration factor achieved by RO and FO, while NF and IX efficiency is a function of the level of impurities in the concentrated eluate, being ions other than lithium and chloride.

2024 Process Test-work - DLE Pilot Plant

The Company is now focused on finishing the commissioning and testing of the pilot plant to optimise the DLE process and produce high quality lithium chloride eluate for conversion to battery grade lithium carbonate. Construction is complete with all columns now loaded with Lanshen resin and commissioning is continuing. Process conditions were required to be adjusted and optimised for the Lanshen adsorbent that has a higher adsorption capacity than the Sunresin adsorbent for which the pilot plant was designed. Adsorption capacity is important as higher adsorption capacity will require a smaller DLE plant resulting in lower capex for the DLE plant. The Company will be updating the market on pilot plant progress on an ongoing basis.



Figure 4: CTL's pilot plant at the Company´s R&D Centre in Copaipó. The blue columns (approx. 2.5 metres tall x 30) are loaded with Lanshen's resin. The green bioplastic vessels on the right will feed the columns with brine from Laguna Verde. Figure 5: Puritech technicians on site during the construction phase - late December 2023



Figure 5: Puritech technicians on site during the construction phase - late December 2023

Glossary of Terms

Term	**Abbreviation**
Total Organic Carbon	TOC
Total Dissolved Solids	TDS
Sodium	Na
Reverse Osmosis	RO
Forward Osmosis	FO
Nanofiltration	NF

Competent Persons

The following professional acts as qualified person, as defined in the AIM Note for Mining, Oil and Gas Companies (June 2009) and JORC Code (2012):

- Marcelo Bravo: Chemical Engineer (Universidad Católica del Norte), has a Master's Degree in Engineering Sciences major in Mineral Processing, Universidad de Antofagasta. He currently works as a Senior Process Consulting Engineer at the Ad-Infinitum company. Mr Bravo has relevant experience in researching and developing potassium, lithium carbonate, and solar evapo-concentration design processes in Chile, Argentina, and Bolivia. Mr Bravo, who has reviewed and approved the information contained in the chapters relevant to his expertise contained in this announcement, is registered with No. 412 in the public registry of Competent Persons in Mining Resources and Reserves per the Law of Persons Competent and its Regulations in force in Chile. Mr Bravo has sufficient experience relevant to the metallurgical tests and the type of subsequent processing of the extracted brines under consideration and to the activity being carried out to qualify as a competent person, as defined in the JORC Code. Mr Bravo consents to the inclusion in the press release of the matters based on his information in the form and context in which it appears.

The information communicated within this announcement is deemed to constitute inside information as stipulated under the Market Abuse Regulations (EU) No 596/2014 which is part of UK law by virtue of the European Union (Withdrawal) Act 2018. Upon publication of this announcement, this inside information is now considered to be in the public domain. The person who arranged for the release of this announcement on behalf of the Company was Gordon Stein, Director and CFO.

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Notes

CleanTech Lithium (AIM:CTL) is an exploration and development company, advancing the next generation of sustainable lithium projects in Chile. The Company's mission is to produce material quantities of battery grade lithium by 2024, with near zero carbon emissions and low environmental impact, offering the EU EV market a green lithium supply solution.

CleanTech Lithium has two prospective lithium projects - Laguna Verde and Francisco Basin projects located in the lithium triangle, the world's centre for battery grade lithium production. They are situated within basins entirely controlled by the Company, which affords significant potential development and operational advantages. The projects have direct access to excellent infrastructure and renewable power.

CleanTech Lithium is committed to using renewable power for processing and reducing the environmental impact of its lithium production by utilising Direct Lithium Extraction. Direct Lithium Extraction is a transformative technology which only removes lithium from brine, with higher recoveries and purities. The method offers short development lead times, low upfront capex, with no extensive site construction and no evaporation pond development so there is no water depletion from the aquifer or harm to the local environment.

****ENDS****

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