

Our Lithium ion battery (LiB) Recycling Project



 **JX Nippon Mining & Metals**



26Aug2021

1. Executive Summary

Our key recent developments

Summary

JX Nippon Mining & Metals Corporation (President: Murayama Seiichi; the "JX Metals") is pleased to announce the establishment of a new company, [JX Metals Circular Solutions Europe GmbH \(the "JXCSE"\), on 1 August, 2021 in Germany. JXCSE is established to promote the used automotive lithium-ion battery \(LiB\) recycling project and battery materials project together with TANI OBIS GmbH.](#)

JX Metals group is preparing for an anticipated large-scale influx of used automotive LiBs in the near future and is working on the development of recycling technologies to achieve "closed-loop recycling" by utilizing minor metals in used LiBs as raw materials for new automotive LiBs. It is also engaging in technology development including the development of materials for solid-state batteries that are expected to be utilized as the next generation of batteries.

Executive Summary (1/4)



JX HQ in Tokyo

1 Our company profile (Annual sales Level)

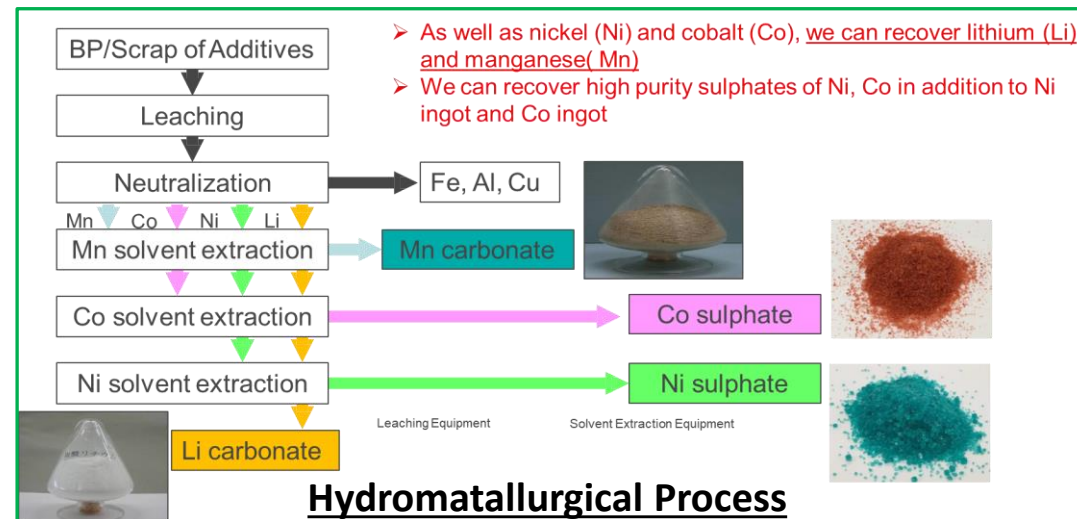
- ENEOS (JXTG) group, approx. 10,000 billion JPY, (80 billion Euro)
- JX Nippon Mining & Metals, approx. 1,000 billion JPY (8 billion Euro)
- TANIOBIS GmbH (Former H.C. Starck Ta & Nb), approx 200 million Euro

2 Our world top class refining process of Black powder (Hydrometallurgical process)

- We can secure high quality of metal salts, & good recovery rates of Ni (ca 90%), Co (ca 91%) and Li (ca 70%). ※1
- Our Tsuruga recycling plant (Japan) has been operated since 2009.

**Our LiB recycling
Hub & R&D in Europe**
→ Goslar, Niedersachsen

**Our LiB recycling
Hub & R&D in Japan**
→ Tsuruga, Hitachi



TANIOBIS Goslar site
in Niedersachsen

※1 Subject to pre-treatment conditions.

Executive Summary (2/4)

3 Recycling process/strategy in current & mid. term

- Recover top class quality Ni sulphate, Co sulphate, Li carbonate, and supply them to the battery cathode manufacturer.
- Considering to construct our LiB recycling site in Germany utilizing our R&D location in Goslar / Niedersachsen based on our business development.

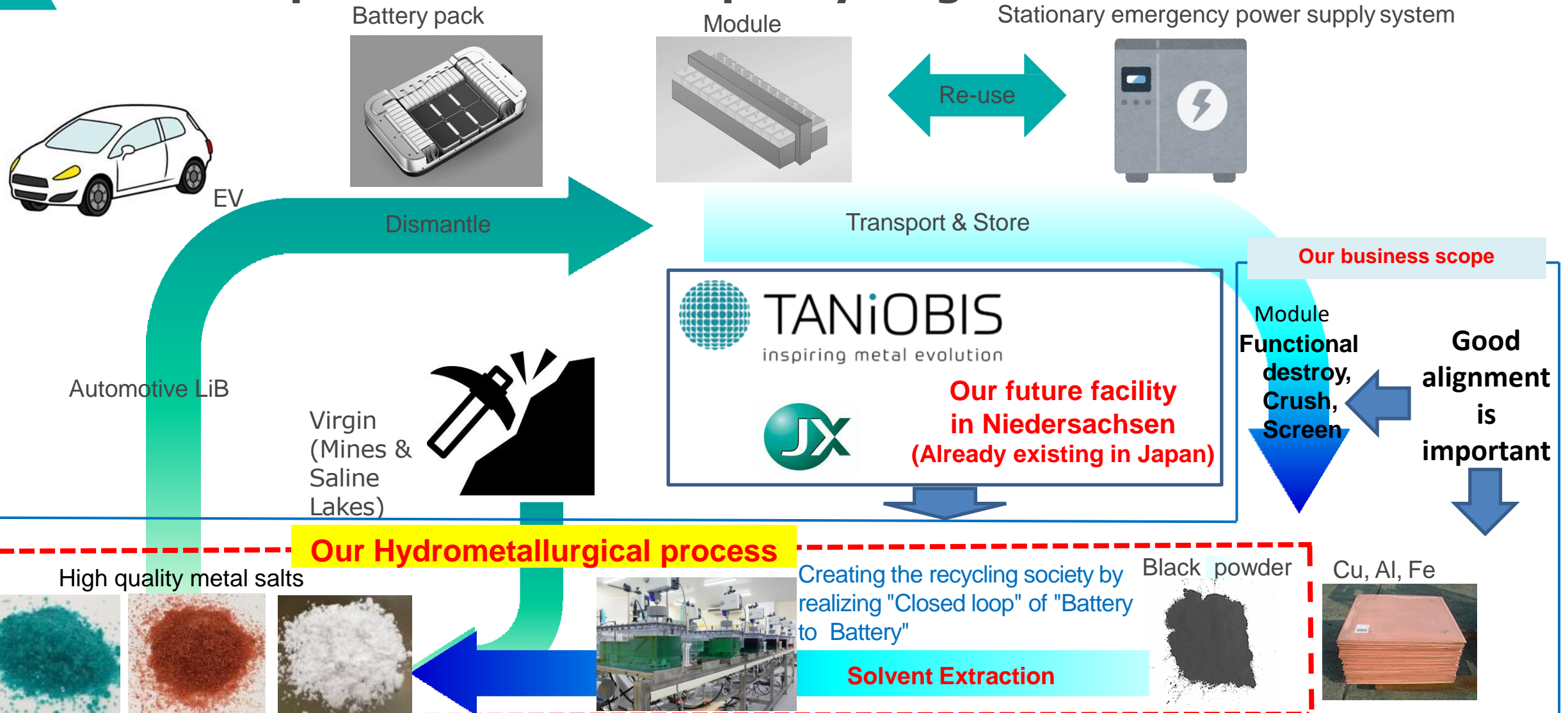
4 Current capacity

- Hydrometallurgical process (to treat Consumer LiB 1,000t/year), in Tsuruga, Japan.
 - ✓ Currently under modification to produce Ni & Co sulfates and Li carbonates directly from battery.
 - ✓ Ready to expand our capacity with the market development
- We also have our Lab scale plant (Hydrometallurgical process) in Hitachi, Japan.



Executive Summary (3/4)

5 The concept of our Closed loop recycling



Executive Summary (4/4)

6 Our Key Strength

- TANIOBIS is the German company in Niedersachsen. We have our R&D in Goslar.
- We can supply the first class Ni Sulphate, Co Sulphate, Li Carbonate (For LiB Cathode materials manufacturer) through our hydrometallurgical process that is extremely effective for Lithium ion battery recycling process.

Appendix (Details)

Appendix. Tsuruga LiB recycling plant



■ History

1970-1980	Production of Ni & Co by solvent extraction-electrowinning (SXEW)
2005~	Developed LiB recycling technology based on SXEW
2009	“Rare metal recycling development project from lithium-ion batteries” project
Oct. 2009~	Inauguration of Tsuruga plant
Apr. 2010~	Start operation (mainly treated scrap of positive electrode active material)
2015~	Start semi commercial scale (LiB 1,000MT/year=Black powder 600MT/year) operation (by processing consumer-LiB)
Jul.2021~ Oct.2022~	Recover battery grade Ni sulphate (Phase1) Recover battery grade Co sulphate (Phase2)

■ Technical Features

- Develop/operate a safe and efficient battery transportation, storage, and pre-treatment (battery function destruction) method
⇒ Established highly efficient recycling technology that minimizes the risk of heat generation and ignition
- Hydrometallurgical (SXEW) process (based on our unique Ni-Co smelting technology)
⇒ High-purity Co, Ni, Li, (Mn) can be recovered

Appendix. Hydrometallurgical process at Hitachi Lab scale plant

