Press release, September-01-2020

Swiss Battery – A research company, Aarau, Switzerland

Global Battery World:

Current Issues with the Lithium Ion Batteries

A clean way to store energy is to use batteries

Lithium-ion-batteries are considered to be a key technology in order to achieve the energy transition targets with the policies set by many governments worldwide. Recently, Scientists have received the Nobel-prize in chemistry for the discovery of the lithium-ion-battery. The Nobel prize is awarded for breakthrough discoveries that impact the society.

Increasing applications and a growing market for lithium-ion-batteries

Today's lithium-ion-batteries are used to power electric vehicles (EV), hybrid- (HEV) and plugged-in electric vehicles (PHEV), buses and robotic vehicles. Moreover, lithium ion batteries are important for a growing market in stationary energy storage applications (power-walls, mini-power-grids, power back-ups, power storage for photovoltaic solar (PV) systems, consumer electronics and medical electronics.

The best Lithium battery for electric cars

What is the best lithium-Ion battery to power a car? Often, the best battery means the battery which has the highest energy-density. A high energy-density allows to drive an electric car (EV) far over multiple hundreds of kilometres and miles, respectively. Using nickel- and cobalt-metal compounds allows to operate the battery cell to a high potential (3.6 Volts) which allows to store more energy. NCA (Lithium-Nickel-Cobalt-Aluminium-Oxide) and NMC (Lithium-Nickel-Mangan-Cobalt-Oxide) are two of the most common high-energy

density type of batteries using the Nickel/Cobalt chemistry. Most car manufacturers are using currently batteries of the Nickel/Cobalt type.

Energy consumption during lithium-ion-batteries manufacturing

Unfortunately, both of the popular high-energy density batterie chemistries NMC and NCA batteries use toxic cobalt an nickel metal which is sourced by energy- and water-intense mining techniques - often in development countries. Metal mining is responsible for ~6% percent of the global greenhouse-gas (GHG) emissions and the water use is high. Often, the energy consumption during mining is not considered in the total grey energy/CO_2 bills that are published.

The climate change is expected to result more frequently droughts and flooding's, altering the supply of water to mining sites and disrupting operations which may make mining even more problematic in the future.

High future battery demand – The increasing battery raw materials demand in the car industry will further push metal mining. Using critical commodity metals is not without risk for the battery/car industry. The projected increasing demand of battery materials may drive the commodity prices up. In addition, future political and local trading bans of battery raw materials can result in unexpected price volatility and raw materials may not be available in sufficient amounts.

There is an effort in the car industry to steadily reduce the highly critical and strategic metal cobalt. However, to reduce cobalt remains a challenge. Nickel an essential and equally toxic metal when released to the environment, is the key commodity material in EV batteries for the foreseen future.

It is expected that the demand of essential battery materials will massively increase through the year 2050. It is projected that the global Lithium battery production will use ~600 % more cobalt, ~100% more nickel and ~1000% more lithium than produced today.

Will efficient recycling of essential battery materials exist in the future?

One way to save is raw materials is recycling. However, large Lithium-ion batteries used in electric cars are highly complex electrochemical devices containing many different metals, polymers, solvents and minerals. Recycling will be partially possible. However, separating materials involve multiple costly processes. Developing cost-competitive recycling to yield single high-quality battery components is challenging. Moreover, the various different battery types on the market will make it challenging to build up a systematic and efficient international recycling regime.

It is therefore likely that metal mining will be the primary and the cheapest way to yield high-quality battery raw materials in the near future.
Waste management and modern circular economy approaches will help to reduce nickel and cobalt waste by ”second use” of old batteries, and reduce cobalt and nickel in composites. However, an innovative material substitution strategy will be necessary to give a next generation lithium batteries using more sustainable battery materials.

Swiss Battery develops new battery technologies using renewable materials that help to address current issues of the battery industry.

Follow US on LinkedIn.
or email US research@swissbattery.swiss