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CEO
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Hydro

	Sustainable mobility / Critical raw materials
	Product and manufacturing process
✓	Applied for EU Innovation Fund and IPCEI
✓	Innovation applies to batteries, which can be utilized across sectors, e.g., mobility, ESS
	Localized, sustainable production
	Technology Market access
✓	Close collaboration with cell manufacturers, partners as well as academia.
✓	Across sectors
✓	Conditional on other factors
👍	

A giant leap to sustainable electrification

According to the International Energy Agency, the transportation sector was responsible for 37 percent of CO2 emissions from end-use sectors in 2021. To fulfil the EU's commitment to become the first zero emission continent by 2050, green mobility transition is an important lever.

By 2030, the European Union aims to have at least 30 million electric vehicles (EVs) on its roads. Yet, this is not a given – Europe will likely face significant shortages of several raw materials that are key inputs for electric vehicle battery production.

One of the materials needed in large quantities for battery production is graphite, today's leading material for the negative electrode of a battery, the anode. Graphite makes up about 15 percent of the weight of a lithium-ion battery, which for a medium-sized EV translates into 50-70kg of graphite. With these quantities in play, securing sufficient material supply is a challenge.

In addition, the carbon emissions of both supply chains and production processes are concerning. Battery materials are typically produced in Asia – by an energy intensive industry that largely relies on coal-powered electricity. About 85% of production capacity for anode materials is located in China.

Today, synthetic graphite production creates significant environmental issues. But this can change. If we manage to improve processes, synthetic graphite has the potential to become the most sustainable battery anode material available for all environmental impact categories. And in contrast to mined battery materials, it has minimal conflict potential.

New company, one purpose

Vianode, a Norwegian company owned by Hydro, Elkem and Altor, set out to produce sustainable synthetic graphite. The company's industrial pilot plant in Kristiansand, Norway has been operational since April 2021 – a first step towards building industrial leadership in advanced battery materials – and to bringing us closer to fast, sustainable electrification.

Although the battery value chain is considered young in Europe, Vianode can draw on a long industrial history. Both Elkem and Hydro have more than 100 years' experience in large-scale manufacturing of advanced materials.

Vianode itself has roots in Elkem's Carbon Division. The first blueprints were drawn in 2016 as an R&D initiative, leading to the establishment of a separate unit and later Vianode. Backed by the two industrial innovators, and entrepreneurs from Altor, a Swedish private equity fund, Vianode can safely label itself as a scale-up with legacy.

A sustainable battery industry

Vianode's synthetic graphite can be obtained by graphitisation of carbon sources, mainly coke, at high temperatures, resulting in a final pure product. Synthetic graphite is today the most common anode material and enables increased range, faster charging, long service life and recyclability and increased safety in EVs. All features support faster EV adoption and enable a well-functioning second-hand market for batteries.

Vianode has developed a revolutionary technology for the graphitisation process. Combined with closed and cleaner processing and renewable electricity from hydro-power this innovative technology helps reduce CO2 emissions by more than 90 percent compared to conventional production. While most current synthetic graphite anodes have a footprint of above 20kg. CO2 equivalents per kg. Vianode's anodes have an estimated footprint approximately ten times lower - below 2 kg. CO2 equivalents per kg. For that reason, Vianode's anodes are a key input to European cell manufacturers with ambitious sustainability targets. The efficient technologies and production process also contribute to reduced raw materials consumption.

This leap is made possible by specialised and proprietary expertise in high temperature and closed production processing systems. The closed furnace technology reduces energy consumption by up to 50% in the graphitisation part of production, compared to conventional production. Furthermore, reduced energy consumption helps minimise other direct emissions.

Sustainability and the green transition are also key themes for Vianode's input materials. By using coke, we are converting a by-product from fossil energy production into an enabler for new green industries. In the future we will also enable circularity, as our R&D on the recycling of anode graphite yields promising results. We are prepared for full circularity once the battery recycling industry matures.

Vianode has already decided to invest 2 billion NOK in an industrial scale plant. Towards 2030, the company will invest in more capacity, and aims to produce synthetic graphite materials for 2 million EVs per year.

The scale-up challenge

We have mastered the technical challenges – and we have a strong business case: Vianode's innovation has the potential to enable a sustainable European battery value-chain and reduce Europe's dependence on imports from third countries.

And yet we have not surmounted all hurdles for scale-up. Why is that?

First, funding remains a challenge. Vianode's owners are committed to investing into the scale-up of production, but the project can be de-risked and built more quickly if supported by EU funding - for example by the EU Innovation Fund and or as part of an IPCEI. Yet in both cases, the application processes are slow with an uncertain outcome. A simpler and more streamlined process with clear conditions for grants, would speed up the process and make future-planning easier.

Second, the Critical Raw Materials Act could be a gamechanger for a European battery value chain. Natural graphite is already listed as a critical raw material. By recognising synthetic graphite as interchangeable with natural graphite, the EU would strengthen its opportunity to sustainable source critical battery materials.

One innovation lesson is that when a breakthrough materialises, we should grasp it and nurture it. If it ticks all the boxes, let's create the right conditions for maximum impact.