Lithium-Ion Battery is the next generation of battery that could be a renewable energy and could be used for carbon capture.
As the need for sustainable energy generation becomes ever more apparent, a means of efficient energy storage for intermittent power generation, such as wind power, is crucial.

Lithium-Ion Battery could reduce global carbon emissions , which is practical in achieving deep decarbonization.

What are Lithium-Carbon Dioxide Batteries?

Lithium-carbon dioxide (Li-CO2) batteries are composed of two electrodes: a positively charged lithium anode and a negatively charged porous carbon cathode.

During charge and discharge, electrons pass between these electrodes via an organic electrolyte infused separator. The incorporation of an active electrolyte catalyst in the cathode increases efficiency. This general process of charge and discharge cycles is concurrent with the operation of other lithium batteries such as lithium-ion batteries.

The differentiating factor that has sparked the interest of researchers worldwide is the promise of a specific energy density seven times greater than that of the most commonly used lithium-ion batteries.

These high energy density batteries could, therefore, be a key to the widescale implementation of such energy sources. During the discharge of a lithium-carbon dioxide battery, carbon dioxide is converted to lithium carbonate and carbon, offering a novel means of CO2 capture.

How can Lithium-Ion Batteries Capture CO2?

Due to the chemical stability of carbon dioxide molecules, significant energy input is required to transform this to other chemicals. Therefore, it is likely that the emissions produced by this process outweigh the CO2 captured.

The most promising avenue to overcome this challenge is to generate the required energy via renewable sources, which is then stored in a lithium-carbon battery. The chemical processes occurring within the battery then fix the carbon dioxide into a solid form.

This crucial chemical transformation occurs as the battery discharges and the electrons are transferred from the lithium anode to the carbon cathode. In doing so, carbon dioxide is converted to lithium carbonate and carbon which is then deposited on the cathode.

As the electron flow reverses during charge, the lithium carbon is recycled, however, the carbon remains on the cathode. This accumulation of carbon with every discharge

cycle blocks the active sites of the catalyst, preventing carbon dioxide diffusion, and triggers electrolyte decomposition.