

## Abstract

This project propose an environmentally-friendly prototype of non-aqueous sodium ion battery using low cost, safe and abundant materials, which have been manufactured and characterized. Moreover, the resultant sodium-ion battery reported an operating voltage of 2.5 V, a declining efficiency down to 80% over 50 cycles and capacity of  $0.052 \mu\text{Ahg}^{-1}$ . This battery could be a sustainable battery to replace lithium ion battery.

## Motivation

The objective of this work is to test high surface area and activated carbon black as an alternative for graphitic carbon in sodium ion battery application.

## Battery Assembly

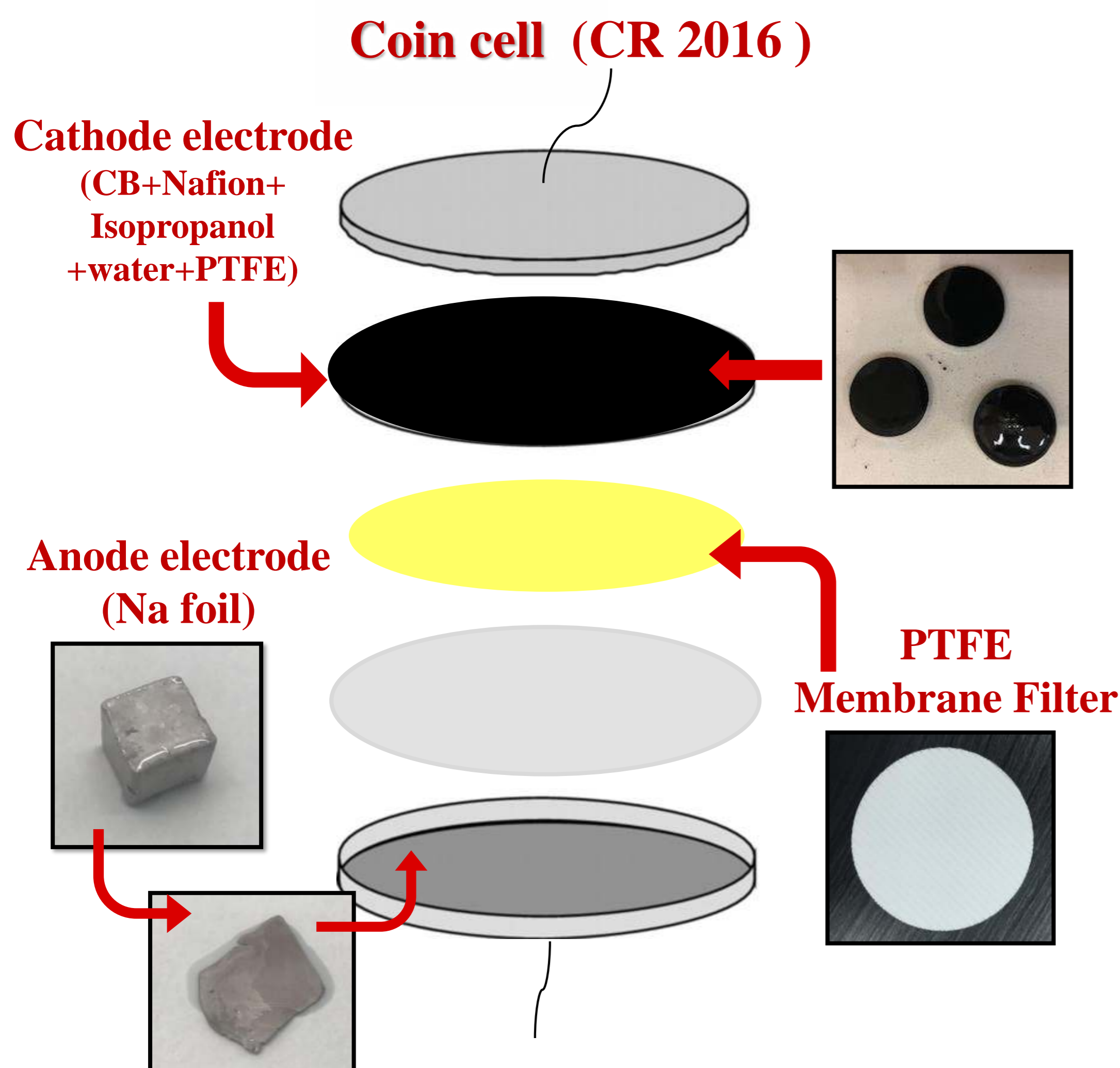


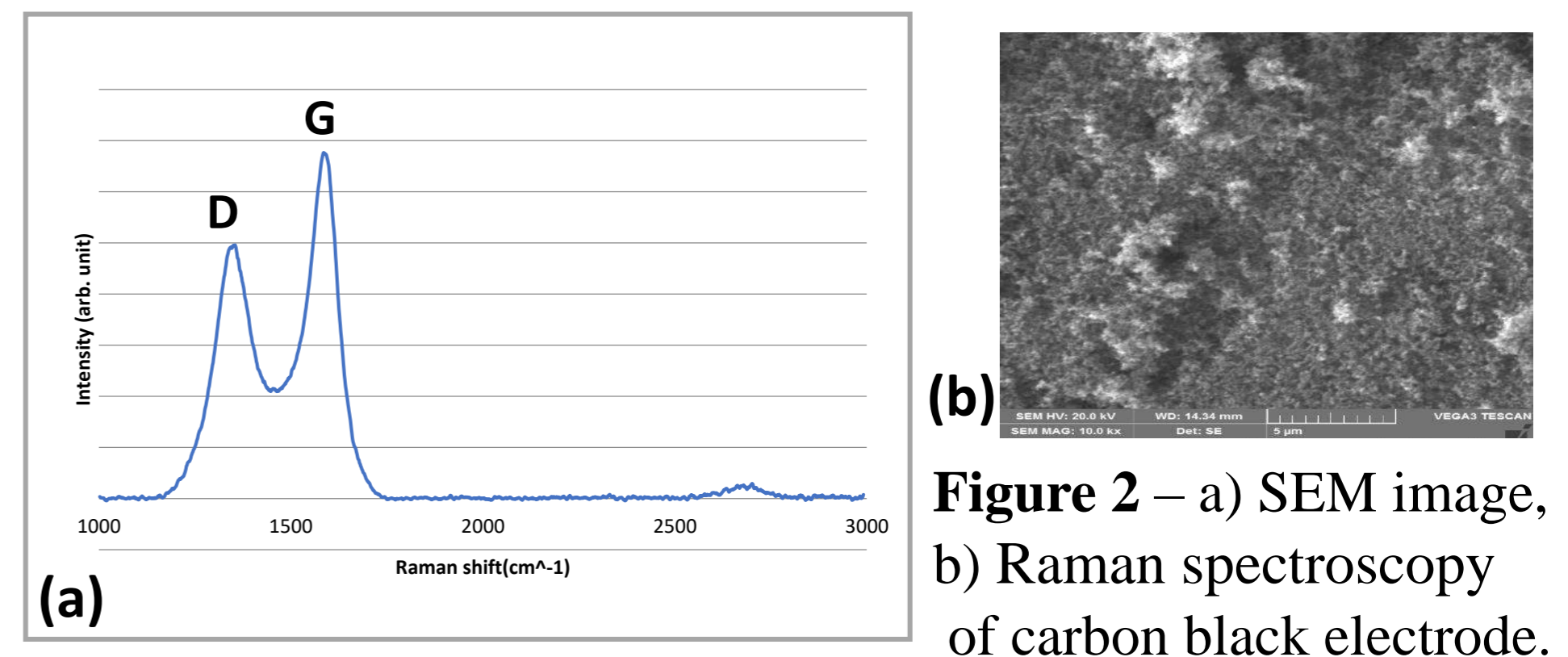
Figure 1 – Schematic of sodium-ion battery assembly.

## Conclusion

To conclude sodium ion batteries field is still young, with many challenges left to solve. So, it is still possible to build a high performance SIB system since it has excellent electrochemical features, abundant and cheap.

## Experimental Results

### 1. Material characterization



### 2. Electrochemical characterization

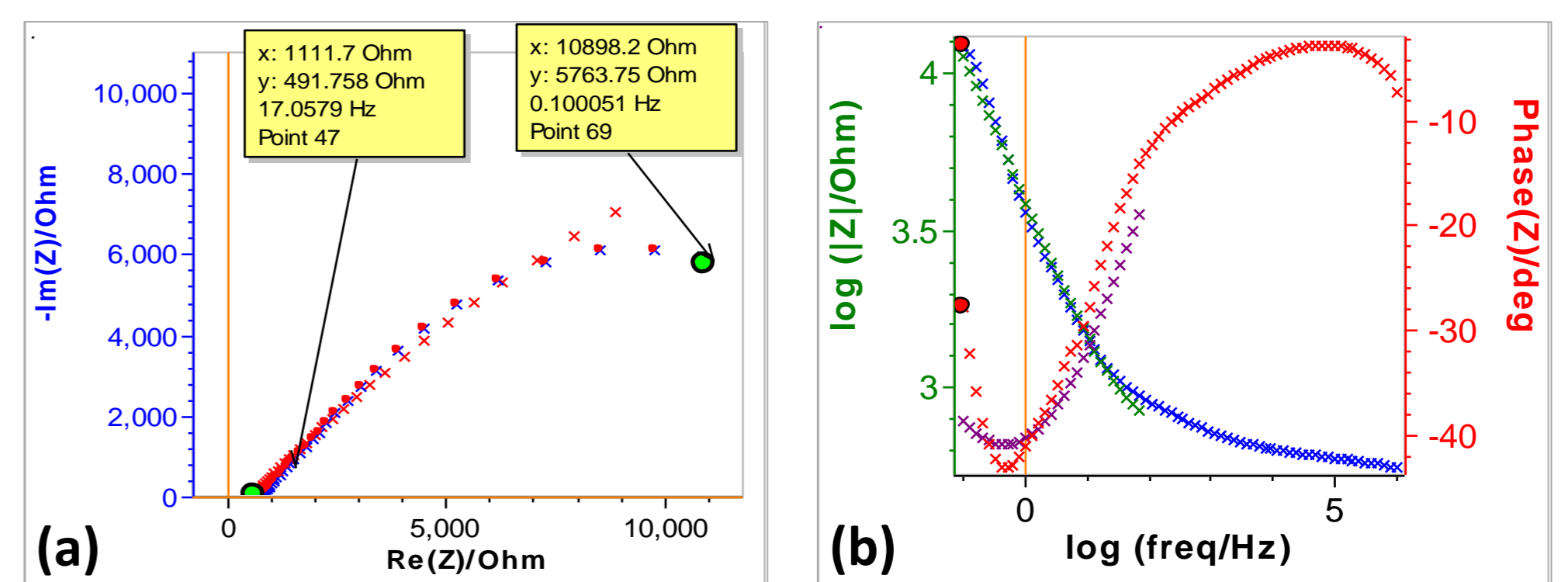


Figure 3 – (a) Nyquist plot of impedance, (b) Bode plot for sodium-ion battery. The measurements for both plots were done from 1 MHz down to 0.1 Hz.

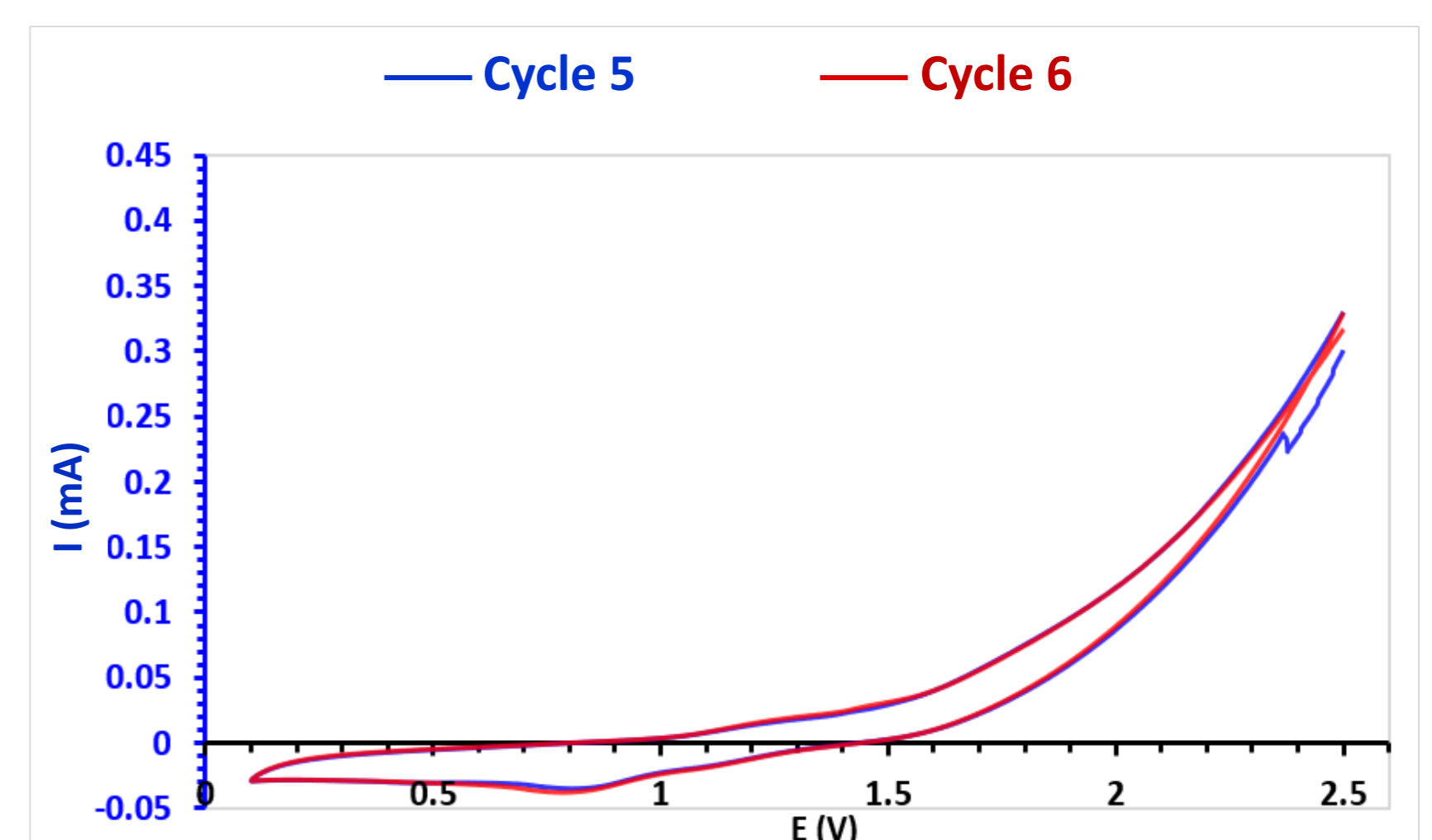


Figure 4 – Cyclic voltammetry of sodium-ion battery.

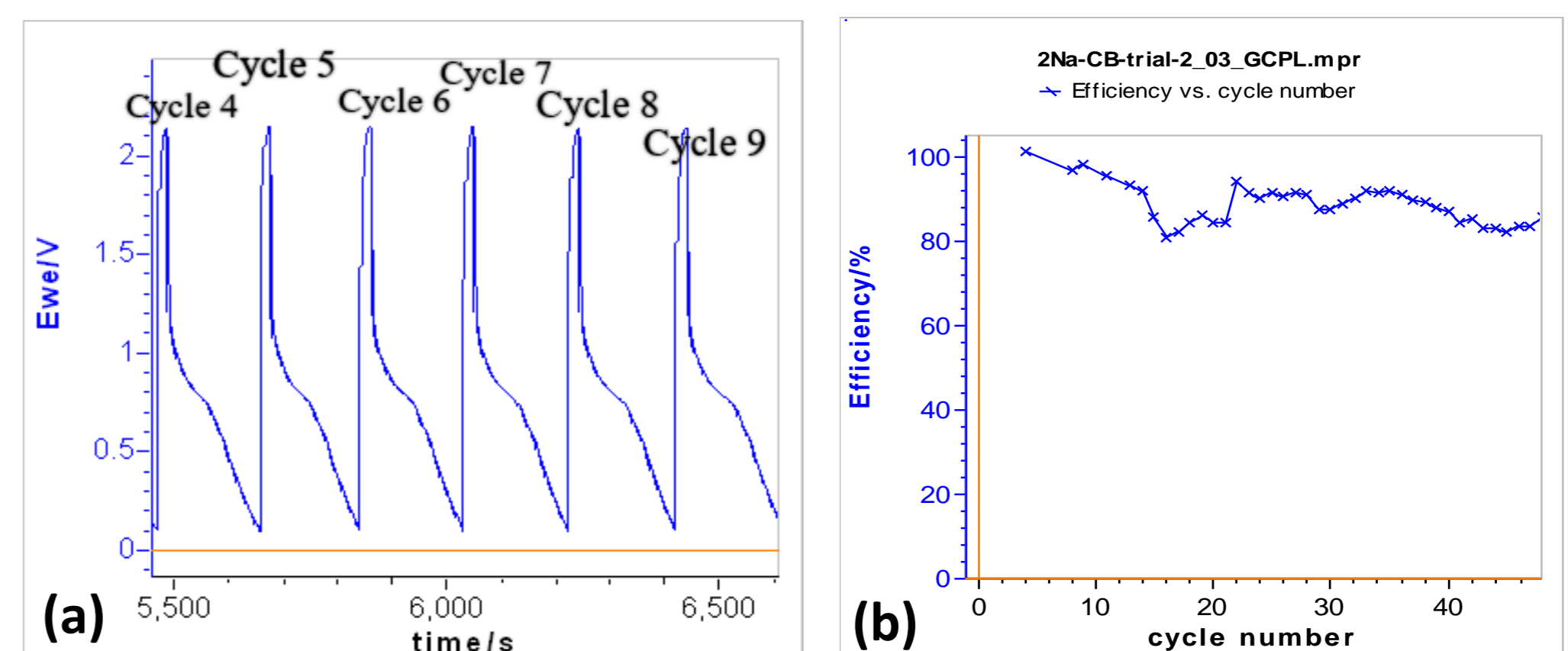


Figure 5 – (a) Charge/discharge profile, (b) Efficiency vs. cycle numbers of sodium-ion battery.