Zn-ion battery improved by reduced graphene oxide/MXene 2D materials

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Rechargeable batteries are one of the most important issues at present, especially given their application in portable electronic devices and electrical vehicles. Li-ion battery has made a significant influence to our society due to high available energy density. However, it does not meet the needs of modern society. One of the disadvantages of this battery is usage of organic electrolyte and its flammability, high cost, toxicity, and the need to provide perfectly dry environment during the manufacturing process. Additionally, conductivity of the organic electrolyte used in Li-ion battery is two orders of magnitude lower compared to aqueous media, which decreases performance rates. All aforementioned properties encourage development of safe, less expensive and green battery devices, such as aqueous Zn-ion battery (ZIB). ZIB shows high potential for commercialization, however, to achieve its practical application an additional investigation of fundamental knowledge on Zn dendrite formation, Zn^{2+} intercalation and reaction mechanisms, electrolyte performance and optimization related to cathodes materials needs to be done [1].

The aim of this work was to study Zn deposition process on various supports such as reduced graphene oxide (rGO) or MXene. It is expected that these materials will influence Zn deposition process and prevent dendrite growth. Furthermore, high surface area of rGO or MXene, along with their flexibility and freestanding properties will contribute to the development of new improved Zn anode materials. The investigation of anode materials was carried out in three/two electrode system by using chronopotentiometry, chronoamperometry, cyclic voltammetry and electrochemical impedance spectroscopy methods. Morphological characteristics of the layer were monitored by scanning electron microscopy and optical microscope.

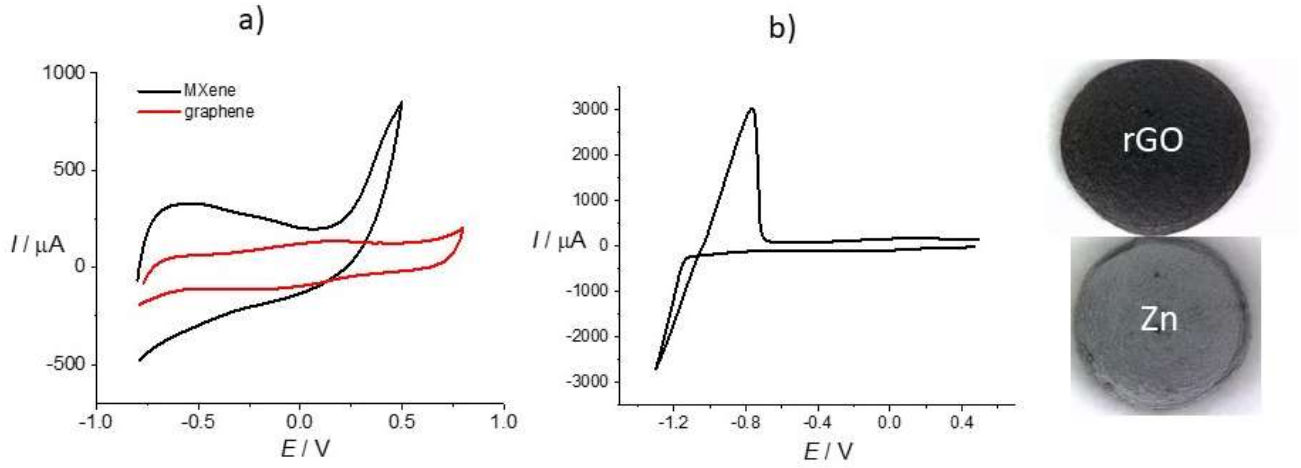

Figure 1. Cyclic voltammetry response of a) rGO and MXene, b) Zn deposition at rGO electrode

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References

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