2,4 V atvērtas ķēdes potenciāla Zn-MnO_2 uzlādējama baterija ar pH gradienta hidrogēla elektrolītu

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Neuzlādējamo bateriju tirgū dominē vienreizlietojamās sārma Zn-MnO_2 baterijas, kas ir daudzsološi kandidāti arī sekundāro bateriju enerģijas uzglabāšanas sistēmām. Tomēr ūdens elektrolītu Zn-jonu bateriju lielākais trūkums ir zems potenciāls un tās ir nepiemērotas daudzreizējai uzlādei/izlādei.
Šajā referātā mēs prezentējam baterjas diazainu bez membrānas ar amfotērisku pH gradienta hidrogēla elektrolītu. Šādā baterijas konstrukcijā anoda pusreakcija noris sārmainā vidē un katoda pusreakcijaz skābā vidē. Tādējādi tiek paplašināts ūdens sadalīšanas reakcijas potenciāla logs un tiek palielināts Zn-MnO_2 baterijas atvērtās ķēdes potenciāls (AĶP) līdz 2,4 V.
Rezultātā mūsu izstrādātā baterija uzrādīja līdz 2,4 V AĶP un pH gradienta stabilitāti vairāk nekā 25 stundas. Tika iegūti 200 uzlādes-izlādes cikli ar izlādes potenciālu 2,2 V – 2,3 V un uzlādes potenciālu 2,7 V, saglabājot stabilu AĶP.

2.4 V Open-Circuit Potential Aqueous Zn-MnO_2 Rechargeable Battery with pH gradient hydrogel electrolyte

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The primary battery market is dominated by non-rechargeable alkaline Zn-MnO_2 batteries which are a promising candidate for secondary battery storage systems as well. However, Zn-ion aqueous batteries suffer from low potential and poor rechargeability. Herein, we present a membrane-less battery type with an amphoteric pH gradient hydrogel electrolyte. This design allows the anode half-reaction to take place in an alkaline environment and the cathode half-reaction in an acidic environment. Thus, widening the hydrogen and oxygen evolution reaction window and increasing the Zn-MnO_2 battery open-circuit potential (OCP) up to 2.4 V.
Our battery concept showed up to 2.4 V OCP and pH gradient stability for more than 25 hours. 200 charge-discharge cycles were obtained with a discharge potential of 2.2 V - 2.3 V and a charge potential of 2.7 V while maintaining stable OCP.

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