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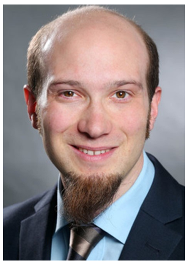
In Situ Hydrogen Evolution Monitoring During the Electrochemical Formation and Cycling of Pressed-Plate Carbonyl Iron Electrodes in Alkaline Electrolyte



Dr. Henning Weinrich | Jan Pleie | Bernhard Schmid | Dr. Hermann Tempel | Dr. Hans Kungl | Prof. Dr. Rüdiger-A. Eichel

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JÜLICH Forschungszentrum

The underlying research was entirely performed at Forschungszentrum Jülich.

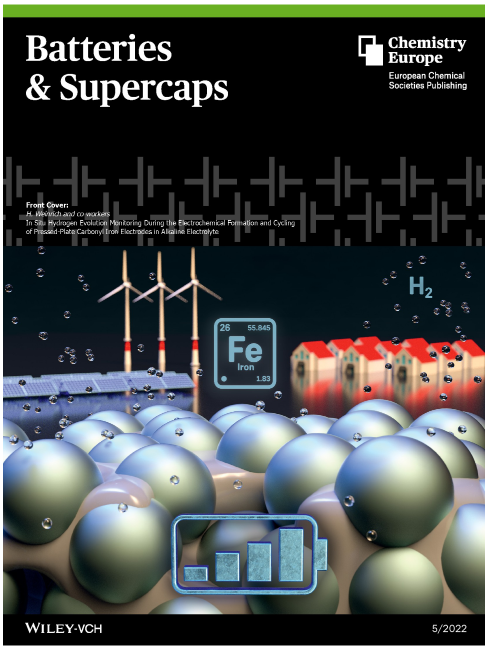
Invited for this month's cover picture is the institute of Rüdiger-A. Eichel. The cover picture illustrates the hydrogen evolution on carbonyl iron electrodes, with the latter being a resource-efficient option to store renewable electricity for stationary applications effectively, if an appropriate charging protocol is applied. Read the full text of the Research Article at 10.1002/batt.202100415.

What is the most significant result of this study?

In this study, we show that the charging potential for a carbonyl iron electrode in alkaline electrolyte should be chosen appropriately, in order to prevent significant charge and electrolyte losses due to hydrogen evolution. Introducing a charge potential limitation of -1.225 V vs. Hg/HgO in a constant current/constant potential procedure allowed us to reach a Faradaic efficiency of 96.7% for a constant specific charge capacity of 200 mAh g_{Fe}^{-1}, since hydrogen evolution at more positive potentials was largely omitted.

What prompted you to investigate this topic?

For us, it was surprising that previous studies did not apply charge potential limitations which are common practice for the investigation of other battery materials such as cathode materials for lithium-ion batteries or zinc anodes for zinc-air batteries. Moreover, based on our previous results, we already developed an in-depth understanding for the processes on our



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model electrode, which allowed us to pinpoint the turning point between efficient and less efficient recharge.

How does your work relate to the goals of the corresponding project?

In iNEW2.0, it is our goal to develop practically relevant Power-to-X technologies, with rechargeable metal-air batteries being a prominent example for a Power-to-Metal-to-Power technology. The work done for this paper is another step towards an efficient iron-air battery, which is a frequently considered but rarely implemented system, despite its tremendous potential for large-scale energy storage applications.

What future opportunities do you see?

Given the vast abundance, worldwide accessibility, low price and excellent environmental friendliness of iron, iron-air batteries have a bright future in case significant effort is made to revitalize the development of this technology. This research shows that technological limitations can be overcome by modern approaches and shall be pursued for the sake of a resilient future energy system.