

Expanded Hydrated Vanadate for Aqueous Zinc-ion Batteries

By using manganese cations to stabilize hydrated vanadium oxide cathodes, this technology enables a practical zinc-ion battery with the potential to exceed the capacity of today's lithium-ion technology.

What is the Problem?

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A zinc-ion battery cathode material made of hydrated vanadium pentoxide can offer a specific capacity of up to 400 milliamp hours per gram, above twice that of today's lithium-ion chemistries. However, it suffers from structural instability and crippling self-discharge. To tackle this issue, two main strategies now dominate. First, the lattice spacing of the material is expanded using alkaline cations to make the reactions occur more smoothly, resulting in more cycles before failure. However, these do not address the degradation of voltage, or the issues with self-discharge. If the full potential of next-generation zinc ion batteries is to be used, it is crucial to develop cathode materials that tackle these fundamental issues with the technology.

What is the Solution?

The addition of ions to the lattice helps to serve as a structural pillar to support the cathode structure, however, the addition of the smaller ions as has been done in previous work does not address the issue of the resistance that slowly builds up over time. The addition of manganese cations instead adds thermal stability, structural stability, and reduces the polarization effects that lead to self-discharge and capacity reduction over time. This innovation's process for the chemical insertion of manganese cations, or other transition metal cations, is an important step forward in creating stable cathode materials for the next-generation batteries of tomorrow.

What is the Competitive Advantage?

Vanadium oxides are promising candidates for cathode materials in aqueous zinc-ion batteries with incredibly high capacity, yet requirements for long cycling necessitate the development of increasingly stable structure. This solution offers a stable structure, enabling practical use of vanadium oxides in batteries. As battery technology pushes towards new horizons beyond lithium ion, this technology offers a viable alternative.

Patent Information:

Technology ID

BDP 8037

Category

Selection of Available Technologies
Cleantech/Energy
Storage/Batteries

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