# Unravelling the Interface Synergy Between Mixed-Phase $MoS_2$ and Binders for Aqueous Zinc-Ion Batteries

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**Abstract**
Aqueous Zinc-Ion Batteries (AZIBs) are a safe and sustainable choice for large-scale energy storage devices. Layered molybdenum disulfide ($MoS_2$) is a potential candidate for these batteries because of its 2D structure and tunable phases that helps store $Zn^{2+}$ ions [1,2]. In this study, the influence of two binders, PTFE and PVDF on the battery performance of AZIB using 2H $MoS_2$ and a mixed phase of the same, 1T/2H using Zinc Triflate electrolyte is tested. Electrochemical investigations revealed that the binder's physical shape had a major effect than the phase of the electrode material. PVDF forms a solid film that blocks active sites and slows down the movement of large triflate ions [3,4]. Therefore, the device using the metallic 1T phase had less performance than that using PTFE, having a web-like structure. The morphology of PTFE ensures that the electrolyte reaches the material easily, leading to much higher capacity compared to PVDF-based electrodes. This work underlines the choice binder is as important as engineering the material itself to unlock the full potential of 2D cathodes [5].

## References

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## Figures

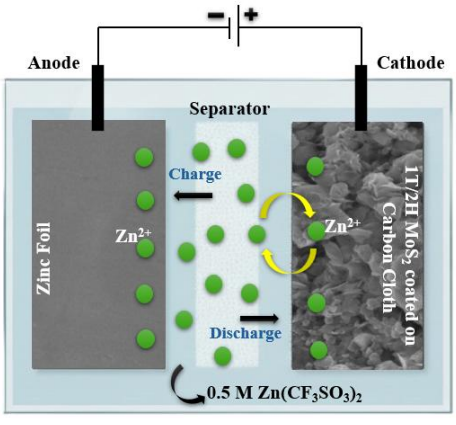


**Figure 1: Schematic representation of the Zn/$MoS_2$ battery intercalation mechanism.** The cell configuration utilizes a phase-engineered 1T/2H $MoS_2$ nanoflower cathode supported on a carbon cloth current collector, a metallic zinc foil anode, and a 0.5 M Zinc Triflate $Zn(CF_3SO_3)_2$ electrolyte. Scanning Electron Microscopy (SEM) micrographs of the anode and cathode used in the study are used in the representation.