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# Effect of the electrode/electrolyte interface structure on the potassium-ion diffusional and charge transfer rates: towards a high voltage potassium-ion battery

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## Abstract

Potassium- and sodium-ion transfer kinetics were compared for the intercalation reactions into $KVPO_4F$ positive electrode material in acetonitrile- and ethylene carbonate-based electrolytes, which implied the formation of different electrode/electrolyte interface structures. The presence of surface layers was found to result in a significantly more pronounced effect on the ion transfer kinetics for $K^+$ compared with $Na^+$, while the barrier layers in $K^+$ electrolytes were demonstrated to be less resistive. Difficulties associated with the stabilization of the electrode material/potassium electrolyte interface under high operating potentials require the application of higher voltage electrolytes. The kinetic trends in three high voltage electrolytes were compared for the potassium (de)intercalation reaction, and the general obstacles to developing a high-voltage potassium-ion battery were identified.

*Keywords:* metal-ion batteries, ion transfer kinetics, potassium-ion intercalation, high voltage electrolytes.

## 1. Introduction

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