# What can we learn from capacitance measurements about ion migration in metal halide perovskites?

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Ion migration in halide perovskites leads to device degradation and changes the properties of the device during operation, both undesirable for applications[1]. The understanding of ion migration is therefore crucial for the fabrication of stable and efficient perovskite devices.

I will present the idea behind transient ion drift as a tool to measure the properties of mobile ions in halide perovskite solar cells and LEDs[2]. The technique is based on the measurement of a capacitance transient at different temperatures. Examples of various perovskite compositions show the power of the technique to determine, for example, the migration pathways along and within the perovskite grain[3].

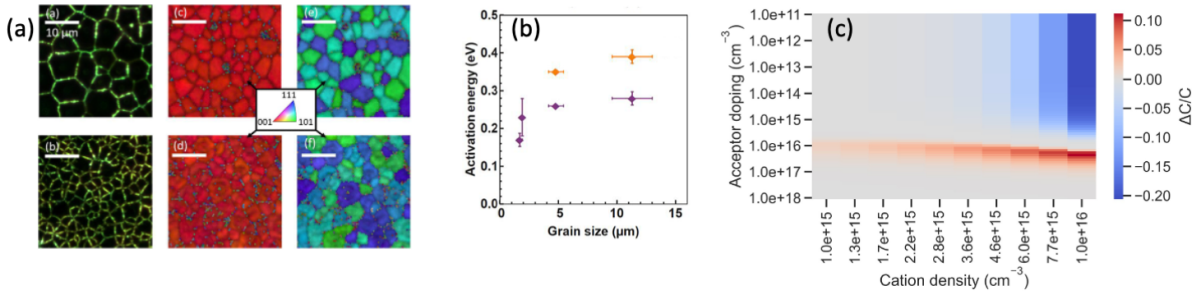


**Figure 1. (a) $MAPbBr_3$ films with various grain sizes, optical microscopy and EBSD images. (b) Activation energy for Br- migration in films of different grain size. (c) Drift-diffusion simulations of the sign of the capacitance change for different ion density.**

In the ideal case, this technique should allow the determination of charge, activation energy, diffusion coefficient and density of mobile ions. However, capacitance measurements of a full device stack are complex, and using drift-diffusion simulations I show that the resulting transient does not always follow the simple, idealized model. For example, while the sign of the transient in the ideal case would indicate the charge, for perovskite devices such assignment is often not possible.

## References

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